agriculture

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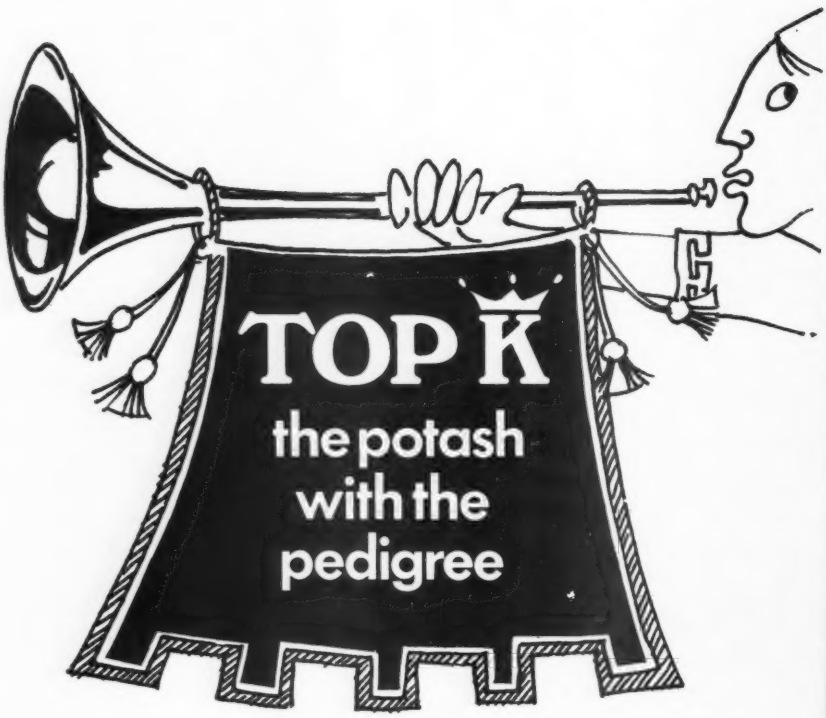

Blowing one's own trumpet is not perhaps the most British habit, but, as Mr Maugham had his character say 'what else is a trumpet for?'
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Agriculture

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AGRICULTURE JUNE 1969

The author, L. Woodhams of the Agricultural Land Service, Cambridge, discusses the principles of dimensional co-ordination and the opportunities presented by industrialization of farm buildings.

Dimensional Co-ordination

THE application of the principles of dimensional co-ordination is not entirely new to agricultural buildings; for some years now the 15-ft bay width has been adopted fairly generally as a controlling dimension for one direction. The obvious advantages that this standard has given to the length of buildings has strangely not been recognized as basic to the other two dimensions of width and height nor, in turn, has the principle been explored in sub-multiples of 15 feet.

With the construction industry now two years into its five-year programme of changing to metric, emphasis is placed on the dimensional co-ordination aspect of the change. More and more the building industry and its customers are recognizing that our traditional construction techniques are consuming a large labour force, and there is a resultant pressure to move towards factory processes of construction.

To take advantage of industrialized systems the component parts which are to be assembled must fit each other, and principally this fit is done by their dimensions; hence dimensional co-ordination. It is also necessary that the sub-pieces, for example, dividing units and the furniture, should fit dimensionally by being of the correct size so that when placed together they will relate dimensionally to the principal building dimensions. Such a relationship is not only necessary for industrialized building systems but is vital to the economic utilization of the total space within a building, not just in the length and width, but in height also.

The concept for such a kit of parts is not new; for agricultural buildings it can be claimed that the 'MAF' frames of the post-war era were a starting point, although, unfortunately, not developed to the same extent as the work on schools, for which the post-war building study was more encouraging.

It is perhaps to the advantage of the agricultural industry that system buildings designed specifically for agriculture have not progressed so far as they have for housing and education. The encouragement of industrialized

building for those two great consumers has resulted in a wealth of closed systems developed by contractors, manufacturers or consortium of consumers, which are not interchangeable. From a manufacturer's point of view the closed system is obviously attractive, but if maximum advantage is to be gained from dimensional co-ordination the open system, with complete interchangeability and freedom for designers, is the only solution.

The first national step towards this goal has been the publication of BS 4330; 1968 Metric Units 'Recommendations for the co-ordination of dimensions in building—Controlling Dimensions'. This standard provides the basis for establishing the principle of dimensions of buildings by modular selection and by actual size recommendation under building types. Compliance with this standard establishes the basic dimensional framework into which the various components are to fit.

The establishing of component sizes within the dimensional framework of BS 4330 will be mainly the direct concern of the manufacturer. Guidance as to the dimensional requirements of components will be given by the British Standards Institution through the technical committees, which in turn are serviced by the 'Functional Groups' set up by BSI to consider and advise on the dimensional co-ordination aspects of structure; external envelope; internal sub-division, services and drainage; fixtures, furniture and fittings; and external works.

Although technical standards will be published by BSI, covering no doubt similar aspects of production as standards do now, it is to be hoped that the decision of how to fill space within dimensional co-ordination requirements can in many instances be left to the component manufacturer. It is particularly in these decisions that the manufacturer's 'know-how', production capacity, market requirements and his many other special skills can be properly employed in competition.

It would be wrong to think that the special reference to dimensions for agricultural buildings in BS 4330 will bring about a sudden and radical change in the development of farm structures. The agricultural industry is estimated as being responsible for two per cent of output of the construction industries; compared with the 50 per cent for housing it could not impart great influence. Of necessity, therefore, agricultural buildings will continue to use the materials and components sized for the big consumer, and be conditioned to those components. However, the application of dimensional co-ordination across the board of the construction industry, with the acknowledged use of preferred increments of size and modules, makes for an easy acceptance of special requirements for agriculture, or any other consumer, provided those special requirements are to the same dimensional discipline.

The programme for changing to metric dimensionally co-ordinated construction necessarily provides a twilight period, expected to last up to three years. During this period buildings, although sized to new units of measure, will absorb 'old' imperial components manufactured to imperial dimensions but given their equivalent metric sizes, so that the buildings can be expressed wholly in metric terms.

The transition period is more necessary for some components than others. Those industries that wear out moulds, jigs and tools at a high rate will no doubt be capable of changing more quickly than those whose production runs do not cover or require re-tooling at short intervals. There may, how-

ever, be instances that demand an early change in industries of this latter type, and it is here that the cost of change must be clearly seen and minimized.

A particular example of cost in a case that may arise by compliance with BS 4330 is the reinforced concrete column. The standard calls for the plan size of columns to be of multiples of 100 mm and for the spaces between controlling lines, be they centre lines of columns or the outside faces of the zone that the column occupies, to be a multiple of 300 mm. Compliance with these recommendations gives a minimum incremental limit of 100 mm to any component or components designed to fill the space between the controlling lines. If the columns were designed to a 50 mm module then the components to fill the space between controlling lines may also need to comply to a 50 mm flexibility. The problems of extra cost for the colums by increasing their size must, therefore, be considered relative to the alternative increased cost of providing 50 mm against 100 mm flexibility of other components.

Increment flexibility will need to be related carefully to dimensional requirements and scale; finer dimensional limits are required in a milking parlour than in a 1,000-ton bulk grain store. But in the latter, the dimensional disciplines at corners and junctions will most probably be common to many agricultural and other building types.

Dimensional co-ordination can, therefore, be the basis for a 'kit of parts' capable of producing any building type, providing a framework not only for design by the architect but also for the component manufacturer and the building contractor who will assemble it. The most difficult aspect, however, may not be in the problems of size and the disciplines of incremental flexibility but rather of how to join the many components together. Jointing techniques for thick components are different from those for thin units, which are different again from the requirements of many sheet components. The establishing of standard systems for jointing is an urgent need if the full advantage of dimensionally co-ordinated components is to be exploited.

To produce components satisfying the dimensional requirements for a building kit will demand standards not only defining technical quality but also performance in use.

At this time of dimensional change there is a vast increase in technology. If this increase is to be encouraged, the technical standards for components defining quality in known materials must give way to performance standards which will allow new and at present unknown materials to be developed.

It may be construed that these developments would produce a range of standard buildings suitable for any purpose; such is, of course, possible and has been so for some time within the limits of the existing systems. I do not believe, however, that such a satisfaction of unknown prospective building owners and functional requirement of buildings is feasible. Apart from the fashions of architecture, which will always influence change, the demands of technical and individual requirements will in themselves prohibit the decline of an open system of building, by components conforming to dimensional co-ordination, to a dull uninspired mass of sameness which is the norm of standard buildings.

To many prospective building owners the production of dimensionally co-ordinated building components will be looked upon as an opportunity to venture into the realms of building design which is the prerogative of the architect. The design of buildings will not be made simple; certain tech-

nological processes now employed by the architect may be reduced in that they will not demand the services of highly skilled personnel, but the actual design process will, as change and advance has always done, demand more skill from the designer who, besides requiring an architectural ability, will need also to be conversant with the problems facing the industrial design of components.

The industrialization of agricultural architecture within the confines of the metric change and dimensional co-ordination can, therefore, be anticipated with excitement at the opportunities it presents and confidence that it will produce an architecture compatible with the advances that agriculture continues to make in every other way.

Success in training new entrants into farming can only be achieved by close and continuous co-operation between student, college, farmer, Local Education Authorities and the Industrial Training Board. The authors discuss on-the-farm training for

Students of Agriculture

Ian Moore **R. J. Halley** **E. F. Thorpe**

THE Report of the Advisory Committee on Agricultural Education 1966 high-lighted a serious weakness of the existing pattern of courses; namely, the haphazard manner in which many students obtain their first real experience of everyday farming. To secure the right practical experience requires a real partnership between farmers and teaching establishments. For many years colleges have stipulated, as part of their entry requirements, a minimum of twelve consecutive months of practical farm work and this is likely to continue with the new pattern of courses. The principal functions of this year are:

1. To see at first hand the full cycle of annual events which make up the farming year.
2. The acquisition of a measure of proficiency in performing basic farming skills.
3. To experience the life of an employed farm worker.

Bearing in mind that for many this will be their first full taste of country life, it is a diagnostic period enabling them to decide if they are fitted for such a life, able to enjoy it and have made the right decision in their choice of career.

Ideally, students should have the opportunity of involvement in all major farm operations during their training periods, with access to the appropriate record data. Whilst, ideally, they should also live as part of the family, if possible, in many cases this is impracticable. Carefully chosen lodgings or hostel accommodation, however, can be most successful alternatives. Living-in with the family is a great privilege, allowing for informal discussion and participation in out-of-hours tasks such as assistance with sick animals, quite apart from an initiation into the domestic life of the farm.

Occasional visits to a farm walk or demonstration, a neighbour's farm, research centre or agricultural show are stimulating to the enthusiastic youngster and should be encouraged. Then, too, guidance in reading and in the maintenance of an appropriate farm diary is most helpful with the new entrant.

So much depends, however, on the attitude of the student, particularly if living as family. Loyalty at all times to the farmer and his staff, respect for confidences, combined with enthusiasm and interest are necessary qualities. A pre-training interview should be held, as compatability between farmer and student is essential if a successful relationship is to develop.

Many problems exist and forbearance is often necessary on both sides. It should also be realized that, far from being 'cheap labour', students often involve the employer in considerable expense and inconvenience.

The level of remuneration varies, but any departure from the minimum standards laid down by the Agricultural Wages Board Orders requires the sanction of the County Agricultural Wages Committee. Provision is made, however, in the Agricultural Wages Act 1948 under section 6(5) 'for the approval of an agreement providing for payment to an employer of a premium in respect of a worker who is an apprentice or learner'. Certainly financial reward should not be the primary consideration; of much greater importance is the opportunity to participate in a wide variety of farm operations and most students soon come to appreciate this facet of the partnership. A good student, with the right encouragement, should be capable of justifying his cost to the employer within a comparatively short period and, with increasing usefulness, many farmers raise their level of remuneration. If there is any confusion regarding National Insurance deductions, the Local Officer of the Ministry of Health and Social Security should be consulted.

A student must train through hard work and should not be cushioned in any way from reality. In the event of a young entrant realizing he has made a wrong choice of career, then this is the time to recognize the fact. In practice the wastage rate is very small.

The education of students during their practical training period can often be enhanced by suitable part-time technical study. Frequently, the award of a college place is dependent on success in an 'O' level examination in one of the science subjects not taken at school, and it will be necessary to attend day or evening classes for this purpose. The farmer is made aware of this situation and gives his approval before the student commences his farm training. Students well qualified academically for the college course can still benefit greatly from attendance at one of the many day or evening classes organized by the Local Education Authorities. The course chosen should supplement any weakness in background or practical training, e.g., absence of some particular enterprise on the farm. At Seale-Hayne

we greatly value the co-operation and work of the county agricultural education officers who, with their staffs, are able to help not simply by placing students on suitable farms, but also by maintaining close contact with them during their training period.

The Agricultural Training Board has introduced a new concept into practical training which is likely to have much impact on the industry. Development of a network of skilled task instructors should, in particular, greatly improve the standard of tuition in practical skills.

For many years now we at Seale-Hayne have been at pains to ensure the development and supervision of pre-college training. Many leading farmers have long co-operated with us in this field and have become close friends of the college. We are thus able to guide young people, on request, to first-rate farms as we have compiled lists of approved farms of various types.

In September each year all intending students are brought to the college for a three-day conference during which all aspects of college life, the various courses and their education pre-requisites, career possibilities, practical training and appropriate supplementary educational activities are covered. Each individual has the opportunity of discussing problems with appropriate members of staff, can absorb a microcosm of college atmosphere and is thereby encouraged to make full use of the farm year and prepare with zest for the full college course.

Farmers who co-operate with the college authorities in student training are invited as a group to the college for a mutual discussion on all aspects of student training, including present and future objectives. The advice of such people is an invaluable factor in the development of education.

Then too, a senior member of staff has been appointed liaison officer for industrial experience and is responsible for maintaining regular contact with intending students whilst on the farm; visiting farmers and students as necessary, and building up and maintaining good relations with all the appropriate individuals and organizations.

A very comprehensive and thought-provoking pre-college diary has been compiled for use by students.* Day-to-day recording forms only one small aspect of this, the various general farm and enterprise sections having been devised as a series of exacting exercises designed to stimulate mental activity and a constant flow of inquiry. Training farmers and students alike are enthusiastic about this development. The diaries are inspected by the liaison officer during the training year and again when the student commences the college course. The evaluation of diaries will feature in the systems of continuous assessment to be adopted with the Higher National Diplomas, and with these new courses a further period of practical training will be required as a sandwich within the course, thus equipping the student even better than now for his future career.

As an incentive to students to maximize effort during their practical training periods, the college trophy—a very fine example of the modern silversmith's art—the premier College prize, is awarded annually to the student of agriculture who, throughout his college training, has displayed the soundest knowledge and best appreciation of the practice of farming. The final assessment for this award is made by a leading practical farmer.

Whilst the training of new entrants is the responsibility of the industry, in the case of pre-college students the responsibility is shared by the college

*This diary is to be published by Crosby, Lockwood in September, 1969, and thus made available to all farm students.

authorities. Success can only be achieved by close and continuous co-operation between all concerned—college, farmer, students, Local Education Authority staffs and the Area Officers of the Agricultural Training Board. This challenge must be faced resolutely if the future farmers, managers, advisers and members of the various ancillary trades are to be adequate for the immense task which lies ahead. They must have the ability to interpret the constant flow of new techniques and economic data with the practical wisdom so essential to the industry.

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The pay off

A local study of potato consumption and marketing was made by Leeds University in 1967. The following article highlights some of its findings based on views expressed by housewives, shopkeepers, caterers and wholesale potato merchants

Potatoes in an Urban Society

S. R. O'Hanlon

IF the importance of the potato in the mid-twentieth century is less than it was when the swollen populations of the factory towns spawned by the Industrial Revolution gave it a status of staple diet, it still ranks as a commonplace foodstuff on the average housewife's shopping list. Over the whole of Britain we eat more than 225 lb per head per year, of which 95 per cent is home grown. As an energy-giving food, knowledgeably cooked, it is a good source of vitamin C in the early part of the season.

The darker areas of our knowledge of how efficiently this humble vegetable is marketed, when and in what forms it is eaten, what are the consumers' choices, preferences and complaints, and the signposting for viable trading in the future are illuminated by the report of a survey* which a University of Leeds team, led by Mrs. Morag C. Simpson, carried out in 1967.

The investigation was admittedly small and confined to the city of Leeds, but inasmuch as this is the sixth largest city in Britain, with a population of some 505,000, one of the major conurbations in the country, and close to an important agricultural production area, the choice was a good one and the results probably applicable to any other industrial town. Like many another city that carries its housing scars from earlier times, Leeds is currently undergoing what is called 'a process of urban renewal', whereby an older generation in pre-1914 working-class districts is having to adjust to economic and social changes. Nearly three-quarters of the dwellings in the city can be classified as working class, and therefore the study is essentially one of potato marketing in that kind of environment.

Shopping bag

It has first of all to be said that the demand for potatoes by the ordinary domestic consumer is highly inelastic. Within reasonable limits, variations in price and income are of little consequence. When old and new potatoes were on sale together the latter were bought as freely as the old, and particularly so by old-age pensioners, despite a price differentiation of 3*d.*–6*d.* per lb. Young male workers and adolescents are the heartiest potato eaters. In this class of household potato buying averaged 5–5½ lb per head per week, and the vegetable was usually served in the form of chips at high tea. Old people and young children eat the least. Surprisingly, the particular occupation of workers was not found to influence consumption; heavy manual workers in Leeds seem to prefer bread to potatoes as a filler, and indeed one miner interviewed admitted to eating a whole white loaf a day. Shopping for families without adolescent males put average weekly buying of potatoes at 2½–3½ lb a head, but where children came home from school for a hot midday meal consumption rose to 6 lb per week.

Just on one-third of those people interviewed had a hot extra meal away from home regularly—in canteen, fish and chip shop or in school—thus increasing total weekly consumption of potatoes per head to 4·2 lb. I think it was unfortunate that, because of the association with public house refreshment, potato crisps were omitted from the survey, since of all processed potato products crisps are the most popular. These apart, there was no evidence of great enthusiasm to try new products.

Among housewives in the sample the convenience of instant mash, prepared frozen chips and canned potatoes appealed only to a mere 6 per cent, mainly it is believed because they are expensive and, as some alleged, lacking in flavour. Neither were prepacked potatoes greatly sought after; 77 per cent of the households questioned preferred good quality loose potatoes if they were available at a comparable price. Various reasons were given, but it seems that shoppers are looking for better grading (therefore no 'demicky'† tubers), absence of greening and sweating and thus less wastage. But it is also relevant, as the report says, that both retailer and consumer should ensure that prepacks are kept in stock for a short period only.

The local shop still gets most of the housewife's custom (63%), with only 6 per cent going to supermarkets. People from old working-class districts now rehoused in new areas stay loyal to the retail market—perhaps as much for social reasons as any other.

Asked what type of potatoes they wanted, 60 per cent of the housewives interviewed preferred redskinned varieties, mentioning King Edward by name, and indeed many expressed their willingness to pay more for them if they were available. Domination of the market by whites was a common complaint. Most consumers were quite indifferent whence their potatoes came; the Lincolnshire limestone and warps so strongly favoured by wholesalers have no meaning for the ordinary shoppers. Cooking quality came in for some astringent criticism. The older housewives were nostalgic about flavour; others blamed the use of chemical fertilizers for internal faults.

Eating out

The demand for potatoes by caterers appears to be much more elastic than in a purely domestic area. The size of servings can readily be adjusted within the price of a meal, and institutional caterers have, of course, to watch their budgets. The majority of works canteens are subsidized and so in a special category although, like institutional caterers, they tend to buy less when prices are high; and they react quickly to increases in wastage at the end of the crop season. Most use Majestic in preference to King Edward, as being able 'to stand up to the treatment potatoes get in the catering trade' without disintegrating; flavour is less important. But they would like to see separate grading into large and medium-size tubers to avoid the necessity for subsequent sorting and wastage incurred in mechanical peeling. Commercial establishments, including transport cafés, are as likely as not to use prepared raw chips, and caterers frozen pre-cooked chips, croquettes, instant powder and canned potatoes to save time in the kitchen.

If there is one particular item of food of which the English never seem to tire, it is fish and chips; and Leeds does its population well in this respect. The 'average resident' buys fish and chips approximately once a week, and he has a choice of 130 selling points in the city, including not only the cash-and-carry kind but also well-appointed restaurants devoted (in more senses than one) to this *plat Anglais*.

The chip side of the business is reckoned to account for one-third of the turnover, and relative profitability as between the two commodities fluctuates seasonally—the one often carrying the other to keep prices steady throughout the year. Summer months show better sales than winter, and a wet day is a dead loss. Here again there was a strong plea for an even-sized sample of potatoes, to facilitate mechanical preparation, cut down wastage and save time in preliminary sorting. Fish-and-chip friers buy ware and new potatoes only. They complained that English potatoes vary too much in quality, leading to cooking difficulties; and they were particularly vocal about the amount of soil present with new potatoes, ascribed to lifting in the rain to catch the market.

Question for the future

Between 65 and 80 per cent of ware supplies handled by Leeds comes from Yorkshire farms, the remainder from Lincolnshire, the Midlands and

Scotland. The wholesalers' principal customer is the independent greengrocer who, on average, sells 66 per cent of the crop. But looking to the future the great question is how far the trade, especially in improved prepacks, may by centralized buying move to supermarkets to the disadvantage of the family-owned corner shop where potatoes have long been a bread-and-butter product. Changes in the pattern of shopping (e.g., weekly instead of more frequently, and those arising out of new urban distribution) could accelerate this. And by the same token potato merchants/packers will need to look again at the pro's and con's of association with supermarkets and other retail chains, plus the profitable disposal of reject potatoes for processing. It follows that producers in their turn will need to buttress their own selling strength—most likely by group action. The potato may be a humble crop but, as this modest survey shows, it is the focal point of a big business.

**Marketing Potatoes in Leeds*, price 5*s*. from the University of Leeds.
†Local farmers use the word 'demick' to describe potato blight. The public have adopted it with wider connotation.

L. W. Wellings, B.Sc.(Agric.) (Hons.), Deputy Director of Gleadthorpe Experimental Husbandry Farm, discusses how to make the best use of

Irrigation

IN the lower rainfall parts of England moisture is often the main factor limiting crop yields. Restricting deficits are reached in the majority of seasons, particularly when shallow rooting crops like potatoes are grown. Irrigation is the answer but with an increasing demand for water for other uses and the costs of application, it needs to be used prudently. During the last twenty years a good deal has been learnt from experiments about crop responses to water, and this information can be used to devise irrigation systems to make the best use of both water and equipment.

Irrigation need

The main factors influencing irrigation need are rainfall, transpiration rate, water holding capacity of the soil and the rooting depth of the crop. Of these factors only the rooting depth is under the direct control of the grower, by his choice of crop; for the rest it is a matter of recording physical measurements which can be used to decide whether water is needed and, if so, how much.

The amount and distribution of rainfall varies tremendously from season to season but taken over a period of years the pattern becomes more regular. Long term weather records can be used to predict how often dry years are likely to occur and also how much rainfall will be below average in such seasons. With this knowledge, in conjunction with information on transpiration rates, it is possible to predict how much water will be needed by crops to keep them growing. The water requirement will determine the size of irrigation plant, which will end up as extra costs. This can only be justified if there is increased production.

Water balance

At the end of winter, most soils are wet throughout and have varying amounts of water available for a growing crop. The amount of water depends on the soil type, (sands hold around 1 in. per foot depth whereas loams can hold 2½ in. per foot), and either the depth of the soil profile or the rooting depth of the plant. This water, together with any rain falling during the growing period, is the moisture credit available to the crop before irrigation is necessary. Water lost through transpiration has to be debited against this and the irrigation need is the amount by which transpiration exceeds the available water plus rainfall. The ideal situation is to end the season with the mature crop having just exhausted the available moisture but this rarely occurs in practice.

Crop response

Economic response to irrigation is affected by which part of the plant carries a cash value. Experimental work has shown that where the valuable part of the plant is the leaf, such as with grass, relatively small deficits can affect yield. If the seed is the important product, then most of the potential yield of the crop can be obtained by ensuring that the soil is near field capacity during the flowering stage. Work on peas has shown that irrigation early in the crop's life increases haulm yield but this will have no effect on seed yield unless the soil is wet at flowering. One or two waterings at flowering for peas will give similar yields to irrigation throughout the crop's life. Experience of moisture sensitive periods on crops such as peas has led to a search for similar stages in other crops.

Cereals are similar to peas in that an adequate water supply at flowering will increase yields but, in practice, irrigation at this stage causes great damage to the crop. Fortunately, returning the soil to field capacity as the stems start to elongate, the so-called boot stage, gives most of the yield benefit and is well worth while in a dry spring.

Work on potatoes has shown different water requirements depending on whether the crop is to be lifted green or carried through to maturity. If

the crop is to be lifted early, frequent irrigation from just after emergence to lifting gives the best results whereas with maincrop production, irrigation need not start till the tubers reach marble size.

In this country commercial irrigation of sugar beet dates from just after the war when spectacular increases, due to watering, were recorded in the dry seasons of 1947 and 1949. Since then, apart from 1957 and 1959, yield increases have been limited and sugar beet has proved to be one of the crops which are more tolerant of dry conditions. It rarely responds to irrigation before the leaves begin to meet between the rows and even on light soils irrigation is not necessary every year.

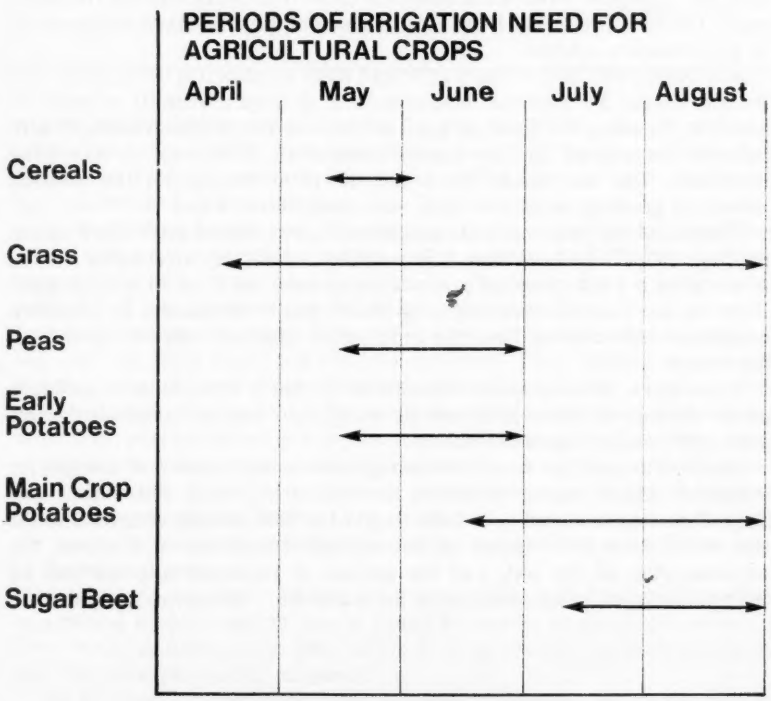
Effect on yield. Yield increases from irrigation vary from season to season depending on the rainfall pattern. Spectacular yield increases were obtained from irrigation in the dry conditions of 1955 and 1959 but these appear to be the exceptions and in many years in the 1960s irrigation has had no effect on yields or has even occasionally reduced them. In deciding whether irrigation is worth while, it is the average response over a number of years which needs to be borne in mind rather than the occasional doubling of yield. Much of the water applied in the 1960s has been thrown down the drain as irrigation has been followed by rain which, because the soil has been at or near field capacity, has been wasted. Soil can only hold so much moisture, and over-irrigation is not only wasteful of water and money but also leeches valuable plant nutrients into the drainage system. With our unpredictable weather some irrigation must inevitably be wasted but it is possible to limit this, particularly on the better bodied soils. By always carrying forward some deficit, say $\frac{1}{2}$ in., even after irrigation, most rainfall will contribute to the soil moisture rather than to drainage water. Where the soil has a good water holding capacity this is possible without getting involved in frequent pipe moving, but on sands where irrigation may be required when the deficit reaches 1 in. pipe moving would become too frequent to be practicable, so some risks have to be taken.

In trying to determine the average crop response to irrigation it is fair to include this wasted water as well as that which was fully effective, as all the costs of application have been met. Over the last fourteen years at Gleadthorpe the total increase in yield of potatoes divided by the total amount of water applied shows an average yield increase of $\frac{1}{2}$–$\frac{3}{4}$ ton per acre inch applied. This is considerably lower than some figures which are quoted because wasted water has been included in the calculation. Similar calculations show yield increases of 1 ton of beet per acre inch, and 2 cwt of cereals when water has been applied at the boot stage. In drier seasons where rainfall had little effect the best returns obtained were 1–$1\frac{1}{4}$ tons of potatoes and $1\frac{1}{2}$–2 tons of beet per acre inch. These responses apply to sandy soil and there is evidence that yield increases will be slightly higher on better bodied soils but irrigation will be necessary in fewer seasons.

Quality. Yield may not be the only consideration in determining whether irrigation is to be installed. Quality of the produce is more under the growers' control if the water supply can be guaranteed and other factors such as optimum fertilizer rates can be applied with confidence. Irrigation has given good control of scab in potatoes on the sand at Gleadthorpe and, indeed, in some seasons has made the difference between marketable produce and an unsaleable product.

Costs

Costs of installing and operating an irrigation plant are considerable. Field equipment of sprinklers and pipes costs between £15 and £30 per acre depending on how much labour will be needed for pipe moving during operation. Saving of labour during irrigation will mean higher capital investment and a system where only the sprinklers are moved around a fixed grid of piping can cost as much as £100 per acre. Agricultural crops cannot stand this level of investment and most systems have to be moved after working in one place for four to ten hours. In addition to the costs of field equipment, a main line to carry the water from the pump to the



field system as well as a pump is necessary. Portable main line costs around 35*s*. per yard of run but underground main, although cheaper per yard of run after grants, has less flexibility and could be more expensive in the end. Water source will affect the decision. If the source is a river, the pump can be moved along the bank to the nearest point to the field to save piping. Where the water comes from a borehole or reservoir, the pumping station is fixed and some underground main may be justified.

The pump must be big enough to supply sufficient water at the operating pressure at the furthest end of the system and this will depend on the distance away and the height the water has to be lifted.

A further factor affecting the capital requirement is the amount of time the plant is expected to operate each day. It is wise not to plan on the basis of very long hours of daily operation as this reduces the flexibility of the system. A normal operating day of twelve hours leaves plenty of margin to extend the working time to cope either with the higher need during very dry spells or to offset the loss of operating time due to breakdown. The total capital requirement for equipment is likely to be in the region of £30–£50 per acre over the total area to be irrigated, assuming that 1 acre-in. is applied every ten days. If expensive source works are required, e.g., a borehole or winter storage reservoir, these costs can easily be doubled.

Under the provisions of the Water Resources Act of 1963 a licence must be obtained before abstracting water from any lake, watercourse or borehole for irrigation. River authorities are entitled to make charges for water under the Act. These vary from area to area but must be taken into account in any irrigation scheme.

Any system will have to carry overhead costs whether it is used or not, and the aim should be to spread these costs over as large a quantity of water as possible. By using the plant as much as possible the overhead cost per acre inch will be reduced but this is only worth while if the water is increasing crop yield. The aim should be to use the plant throughout the growing season by growing crops that need water at different times.

The periods of water need for agricultural crops are shown in the diagram on page 265. This shows that it is possible to build up a cropping system which gives a good spread of potential equipment use from May to August. Potatoes are probably the only crop which justify investment in irrigation equipment but watering the other crops when necessary helps to spread the fixed costs.

Grass has a different water requirement in that it is sensitive to moisture stress throughout the season and its integration into an irrigation system with other crops is more difficult.

Production costs are constantly rising and the introduction of charges for water has added impetus to this in the case of irrigation. This means that irrigation resources need to be used to give the best possible returns, and the use of available information on the climatic conditions of the area, the characteristics of the soil, and the periods of optimum response can all help towards increased efficiency in the use of both water and equipment.

Performance Trial Reports

The following free publications are available from the Ministry of Agriculture, Fisheries and Food, Tolcarne Drive, Pinner, Middlesex.

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27 Winter Wheat, Heima-Desprez (New)
28 Spring Wheat, Sirius (New)

Pig Housing

J. P. Harrison

MANY changes in the type of housing for pigs have taken place over recent years, but there is still no reason to suppose that designs have reached finality. In 1956, for example, the recommended floor area for a fattening pig was between 10 and 16 square feet (1·0–1·5 m^2). Layouts in those days often incorporated open concrete dunging areas, and plenty of straw was used. Fully insulated housing was not widely popular, and building methods were mainly of a traditional character. Feeding in troughs was the usual method and this governed pen design to some extent.

These basic patterns were reflected in sow and weaner accommodation, but over the years they were radically modified. Floor feeding altered pen shapes; open concrete was eliminated; straw became less popular; slats and mechanical feeding and muck disposal systems were developed. At the same time, prefabrication and less permanence in specialized buildings were advocated. Familiar names, like the Hallett; the Henderson; the Reid; the Black and many others dropped out of use, to be replaced by the ubiquitous controlled environment house. Most significantly, recommended floor areas per animal housed were drastically reduced, in extreme cases to 50 per cent of the earlier figures.

Naturally enough there were disappointments and mistakes, as is inevitable in a period of development, but it would be unwise to conclude too much from these. A look at the way in which designers tackled their problems may help to explain what happened.

The solution of a design problem is usually a compromise; this is as true in agriculture as in any other field. The relevant design factors have to be identified and the relative importance of each assessed. In the case of pig housing, these factors include such diverse elements as animal health, economics, nutrition, genetics, farm management, work study, siting and local conditions, manufacturing methods, mechanization, public opinion and social implications. Even when the factors have been identified, the importance of any one of them is difficult to assess; particularly when, as in the case of piggery design, some of the data is not readily available or is disputed. In fact over the last ten years it can be argued that research and development in many of these aspects did not keep pace with the urgent needs of the agricultural industry, at least as far as the effect on buildings was concerned. There are today still many areas requiring study.

The period also saw extensive changes in the financial and economic structure of farming and these are continuing. The progressive reduction in labour on the land was mirrored in the building industry, accelerating the trend towards prefabrication in the factory; a trend however often frustrated in farm buildings due to a fluctuating and unpredictable market.

The provision of grants for fixed equipment stimulated interest in every aspect of farm building design; meanwhile individual farmers and pig keepers continued to develop their individual ideas in their own way preferring practice to theory. This period of uneven development culminated in the appointment of the Brambell Committee and the subsequent efforts to bring some order into the situation. The present climate is inclined to be of caution and some degree of uncertainty as to where we go next. Nevertheless, out of the intense progress which has taken place, it does look as though some kind of pattern may be emerging.

It is emphasized that in this article some housing systems under the headings, farrowing, rearing and fattening are considered in the context of East Anglia where over one-third of the pig population of England and Wales is to be found, but where conditions as to climate and agriculture will not be typical of many other regions in Britain.

Farrowing

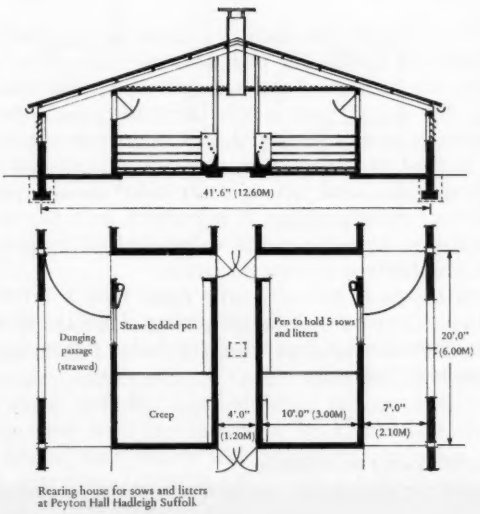
Permanent farrowing crates in a simple well-insulated house conform with management systems rcommended by many advisers, sows being usually farrowed in batches and the sows and litters removed after a period varying between 10 and 20 days. If sufficient pens are provided these can be rested, cleaned and disinfected in turn; a food store is normally incorporated and drainage must be available. Ventilation and heating are easily provided, and housing of this type ensures that the operator has good working conditions both in summer and winter. The photograph below shows a single range layout; in this case the creeps serving the adjoining rearing pens are accessible from the same building, a layout adopted successfully at the Hertfordshire College of Agriculture, St. Albans. The fans are installed here to provide a positive pressure within the building to avoid draughts.

A single range layout type of farrowing crate

Rearing

It has always been recognized that pigs thrive in deep straw, and where this material is abundant, the only objection to its use has been the labour factor in handling. If the pig keeper is prepared to put his batches of sows and litters together at the rearing or 'carry on' stage, layouts are possible which reduce this factor to an acceptable level, without the need to put in mechanical muck shifting equipment. If, in addition, individual feeders for each sow are omitted, and the sows feed on 'nuts' in the straw, the house designer has a much easier task. Present sow feeder designs also have some disadvantages in that piglets may be trapped or chilled; however, the decision on whether or not to use them is one for management.

Two typical designs can be described. The first, shown below, is a layout of pens each to hold five sows and litters in an insulated building, with the dunging area cleared by tractor scraper. A total area including creep, for each sow and litter of about 60 sq. ft (5·5 m²) should be allowed. The larger this area is, the longer time litters may be kept in the pen after weaning, should this be necessary.



Rearing house for sows and litters at Peyton Hall Hadleigh Suffolk

The alternative design, as shown in the photograph on p. 270, is of a range of south facing open-fronted pens, with sheeted gates at the front. The creep is situated at the rear also, to avoid having to go into the pens. The roof should be insulated with sufficient height at the front for mucking out by tractor-loader. As much depth as possible should be given, within the same total floor area. A pen 10 ft wide by 23 ft deep (3m × 7m) including the creep, is suitable for four sows and litters. Construction costs may be lower in this type of pen but external works can cost more and the worker has less protection from the elements. Variations on this layout can be devised to improve it, and individual feeders can be incorporated subject to the provisos already noted.

Open-fronted pens with sheeted gates

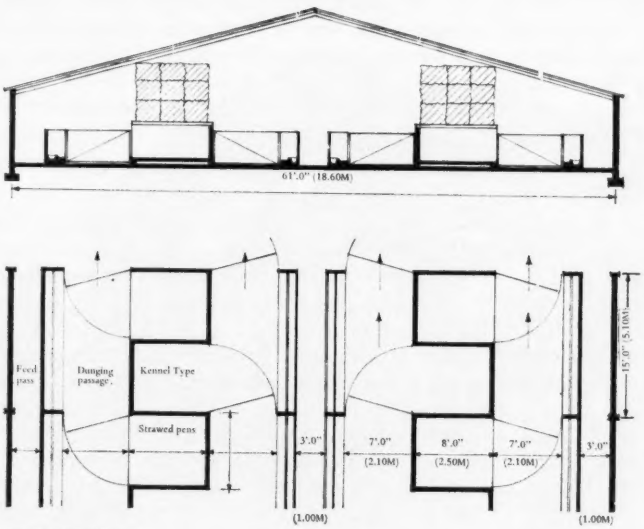
Fattening

There has been a significant reaction against the so-called environmental controlled house, and against the high stocking rates often associated with it. Undoubtedly, the findings of the Brambell Committee has had an effect; the realization that straw muck is less likely to cause pollution than raw slurry; the return to trough feeding and increased use of piped liquid feed; and a certain distrust of too much complex machinery and a wish to keep initial cost down; all these factors contributed to the present attitude. On the question of mechanization it is perhaps only fair to add that the fault does not always lie in the machine, but that incorrect installation and lack of proper maintenance is often the cause.

The resulting design is basically little more than a return to 'kennels', with the addition of cover to the dunging areas. Here the workability of the whole layout is the major factor affecting the design rather than the provision of a steady climate for the pigs.

Kennels formed within a large span building

In the example illustrated on p. 270, kennels are formed within a large span building which, it will be noted, does not necessarily lead to a very cheap solution, since the essential floor area per pig is not less than 13 sq. ft (1·2 m²). However, the building here has a long-term value quite apart from its use as a piggery. The troughs are fed by pipeline and dunging areas cleared by a tractor-scraper.



Fattening house with piped liquid feed system.

Messrs. Justin Brooke Ltd. at Wickhambrook were the first to develop a large-scale layout of this kind in East Anglia and similar schemes have followed in the region and elsewhere. Variations including specialist houses, have taken the name 'Suffolk', and individual farmers have designed and built their own versions often very satisfactorily. There is, of course, nothing original in the design itself which will be familiar to many pig keepers. What is perhaps surprising is the way in which it has proved adaptable to modern management methods.

Sows in a strawed yard

Dry sows

It cannot be said that in this field there is any universally acceptable type of housing. It has been argued on management grounds that the large-scale producer will be obliged to use stalls of one sort or another, while the smaller unit may continue to use strawed pens. The uncertainty on this point arises out of a feeling among many pig keepers that the individual penning of sows may not be the best husbandry. Thus, if it is agreed that intensification beyond a certain point means sows must be kept in stalls, might it not be advisable to restrict the size of enterprise to proportions where they can be kept in their batches in simple strawed pens of a similar pattern to the fattening design described above? This aspect of the problem is perhaps not yet satisfactorily resolved, but the designer cannot produce the answer himself.

The future

These designs discussed are, of course, by no means the only types, as many of the better and proven houses designed on more intensive lines continue to be built. Predictions, however, of a mass development of prefabricated specialist houses, to a standard approved pattern, have not so far been fulfilled. Standardization as an end in itself cannot be justified; it has to prove itself in economic terms to be acceptable. At its worst it can lead to stagnation and the inhibiting of enterprise, whether in layout or in manufacturing techniques.

It may be, of course, that large-scale specialist production will demand a fresh approach to every aspect of pig husbandry in that housing will not be excluded. In any event at a time when the building industry is turning over to metric and when some degree of standardization is bound to follow, it is inevitable that farm buildings of all kinds will be affected.

On the other hand, experience over the last ten years seems to show that pig producers themselves have considerable reserves of energy and initiative. Provided the incentive is there, it seems certain that they could, by modernizing and enlarging their units, often in a modest way, meet any demands made on them. By developing the best designs and those most suited to the present enterprise it is quite possible to achieve higher output per man, with better working conditions for everyone in the industry. Not perhaps a very dramatic conclusion, but one from which some comfort can be derived.

This article has been contributed by **J. P. Harrison, A.A. Dip., A.R.I.B.A.,** who is a Land Commissioner with the Agricultural Land Service at the Eastern Regional Office, Cambridge.

Farm Buildings

This feature, on efficiency in dairy buildings, and building developments at the N.A.C. contains articles by:

J. D. Young, B.Sc.(E.N.) Lond., A.R.I.C.S., who is a Senior Assistant Land Commissioner with the Agricultural Land Service. In October 1967 he was appointed Liaison Officer at the Farm Buildings Centre, Kenilworth, Warwickshire.

L. M. Parsons, B.Sc.(Agric.), F.L.A.S., who is a Land Commissioner (Work Study) and his co-author **E. R. Butler, A.A.I.,** a Senior Assistant Land Commissioner with the Agricultural Land Service.

Efficiency in Dairy Building

L. M. Parsons E. R. Butler

AN article in the September, 1967, issue of this journal described an initial survey conducted by a specialist group of the Agricultural Land Service into dairy buildings in this country*. It was proposed to carry out a further investigation into the 'top ten' in the 'efficiency charts' which were constructed. But, due to the serious epidemic of foot-and-mouth disease there was no question of making any further investigation.

Nevertheless, a re-examination of the information obtained and a comparison of findings with similar projects elsewhere in the world has confirmed some of the earlier conclusions. This re-appraisal has re-emphasized the obvious in many cases. The trouble is that the obvious is *not* so obvious in much of the day-to-day running of many intensive units. In the constant press of daily routines there are usually very good reasons why it should not be, and the difficult decisions that must be constantly made and other difficulties that so frequently crop up cannot but mask some of the items that go to make the job run smoothly.

About one-third of employed time on a dairy holding is occupied by the jobs of feeding, cleaning and littering. It is in these tasks, therefore, that any savings that can be made will be the most attractive. This is not to say that the milking process itself should be ignored. Cleanliness and the requirements of the Milk and Dairies Regulations 1959 must, of course, be observed. No one would suggest that these be sacrificed for the sake of saving time and trouble. Nevertheless, the initial survey results showed a remarkable range of efficiency in the milking process. Only 12 per cent of the farms reached those standards of productivity which could be regarded as really satisfactory. This was disappointing in a way, particularly as so much publicity and attention has been given to better methods over the past few years.

The N.A.A.S. 'Users' Guides to Modern Milking', Parts I to IV, coupled with some specialist help, should prove of great practical value to any producer contemplating changes in layout and design. In fact, on those farms where particular care had been taken at the planning stage, the efficiency of the actual milking process was greatly superior to any of the others. Those herdsmen with less good performances were nearly always working in buildings with only quite small features of bad design which could have been avoided.

*Parsons, L. M. and Butler, E. R. 'Efficiency in Dairy Buildings', *Agriculture*, Volume 74. No. 9. September, 1967.

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The worst offender was the collecting yard. In most cases this seemed too large for the particular group of cows being collected for milking. This, and other aspects, was revealed very clearly by a series of time-lapse films of the 'flow' of cows from yard to parlour. It was obvious that a 'small', almost square yard, where the cows were collected at about 12 sq. ft each or even less, seemed to be very much better than any other shape.

Sliding doors hung internally, or even no doors, were better than the swing type. The films also showed very clearly that it pays herdsmen to be patient and avoid carrying sticks, cloths or towels, as these seemed to make the cows very timid on approaching entrances. The films also indicated that an electric dog or moving gate would save an enormous amount of trouble in keeping cows up to the parlour door.

Turning to feeding, cleaning and littering, available capital investment obviously influences how much can be spent in reducing the eventual labour requirements of any system adopted. As has been said more than enough, 'A man's time should be spent first in thinking, last in physical work'. It is a counsel of perfection to say that handling systems for fodder, litter or manure should be considered as a whole before thinking about purchasing or installing machinery to do the job. This is all very well when a layout is designed from scratch, but in many of the layouts seen, this had not been possible or practicable.

Feeding

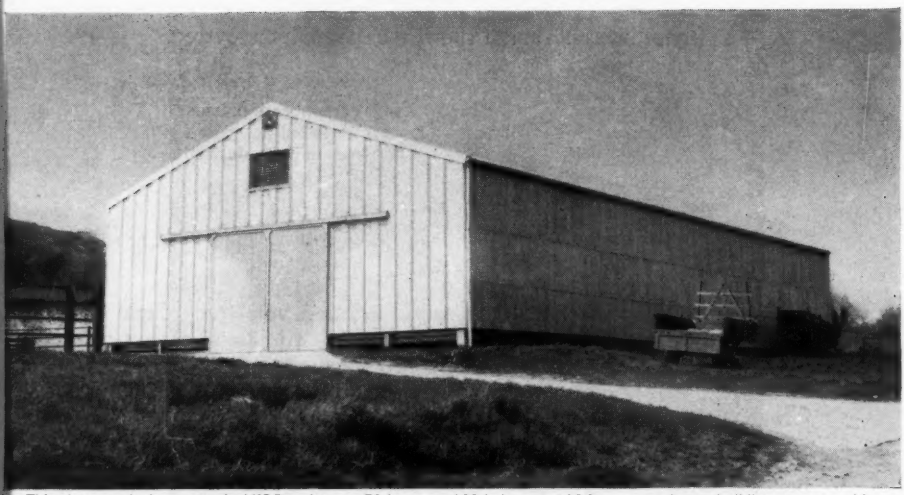
For many years we shall still be adding new buildings to older ones and rearranging or altering them in one way or another. There are almost countless possible variations of fodder, feeding methods, storage, equipment and degrees of access allowed to the stock, but some guides can be deduced.

Firstly, as a matter of interest, the simpler the 'ration' the less labour and effort required to handle and feed it. Therefore it seems that time spent in thinking about any proposed programme of cropping conservation and consumption will be amply repaid when it actually comes to doing the job. Not only the present numbers of stock but the effects of increasing to what at present may seem unattainable numbers should be worked out. In many cases systems which would have been excellent for fewer cows had become very much less efficient because of extra numbers.

At the same time the possible effects of improved methods and greater efficiency of work routines, changes in feeding practices and management, should be allowed for in initial planning discussions.

For instance the change from hand feeding into mangers to the use of augers or side delivery trailers was often impracticable because of corners, obstructions and so on. Or a change-over to self-feed silage could not be achieved without great expense in re-siting accesses, gates and cow routes. Or a complete change to all-the-year-round housing could not be contemplated without re-siting or re-orientating all the non-milking accommodation.

So far as concentrate feeding in the units was concerned, it was surprising to find such a wide range of levels of feeding. The effect of this on costs, and hence profitability, must be significant. The investigation showed very clearly that keeping a constant check both on rations actually fed and on the accuracy and maintenance of machinery, where used, could often have produced substantial savings.



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As a matter of interest Table 1 shows the situation discovered.

Table 1

Breed	Number of herds	Range of number of pounds concentrates fed per gallon of winter milk produced
Friesian	45	1·33 to 4·0
Ayrshire	13	1·60 to 6·0
Shorthorn	6	1·35 to 4·0
Guernsey	3	1·75 to 2·5

As has often been pointed out, any purchased bulk feeds ought to be measured into parlour feed hoppers because this will almost always reduce over-feeding.

Cleaning and littering

Routines and methods for these jobs are obviously greatly affected by building design and constructional details. Much the same criticisms of manure handling can be justified as for feeding systems. It appeared that if much more realistic assessments of quantities and practical methods of dealing with manure had been made earlier, some of the more pressing problems might have been avoided and a lot of effort saved in the end.

Littering requirements were carefully checked because where straw is used considerable labour is expended in handling materials.

Forty of the farmers were using strawed yards and all of these tended to keep their herds in the yards for a longer period in winter than those farmers who used cubicle systems. Table 2 indicates that in most cases more cows could have been kept in the buildings available without much trouble. Indeed, according to the data obtained, the overhead charges for fixed equipment per cow housed on all the farms were high. Not only that, the extra space required labour to clean or litter, which could have been avoided.

Table 2

Herd size	Total space/cow sq. ft		Bedded area/cow sq. ft		Feeding area/cow sq. ft		Straw use in lb/cow/day	
	Range	*Average*	*Range*	*Average*	*Range*	*Average*	*Range*	*Average*
50–69	78–99	91	40–75	54	23–42	32	11–14	13
70–89	70–120	87	36–63	50	27–57	37	7–17	11
90–109	55–90	71	39–56	43	20–34	28	10–16	13
110–129	72–73	72	40–50	44	23–32	28	11–13	12
130–149	63–76	69	39–49	44	24–27	26	6–20	13
149+	47–81	63	27–61	41	20–24	22	6–12	9
Whole survey	47–120	77	27–75	47	20–57	29	6–20	12

The times taken to bed down the yards varied from 0·5 man mins to 5·0 man mins per bale, an average of 2·0 man mins for the number recorded. Previous work has shown that with a good method and proper equipment one bale can be spread by hand in 1·0 man mins. This will be much less if the bales are opened and the cows allowed to spread the bales themselves. The survey showed quite conclusively that the work load of littering could have been drastically reduced on almost all the farms visited. Nearly 60 per cent of the farms had strawyards, and of the most efficient, six out of the ten were

on this system. Of the ten least efficient units, six in fact used cubicles.

Table 2 also shows the space per cow in the sleeping and feeding areas, and the use of straw.

The use of straw varied considerably, as can be seen from Table 2. The recordings indicated that it is quite possible to stretch one bale to bed more cows as the herd size increased. This practice had no apparent drawbacks. Three herds were littered quite satisfactorily at the rate of one bale for every six cows.

Recent investigations indicated that 10 lb straw per cow per day seemed a reasonable target to achieve. Only very large herds actually reached this figure; the remainder used considerably more.

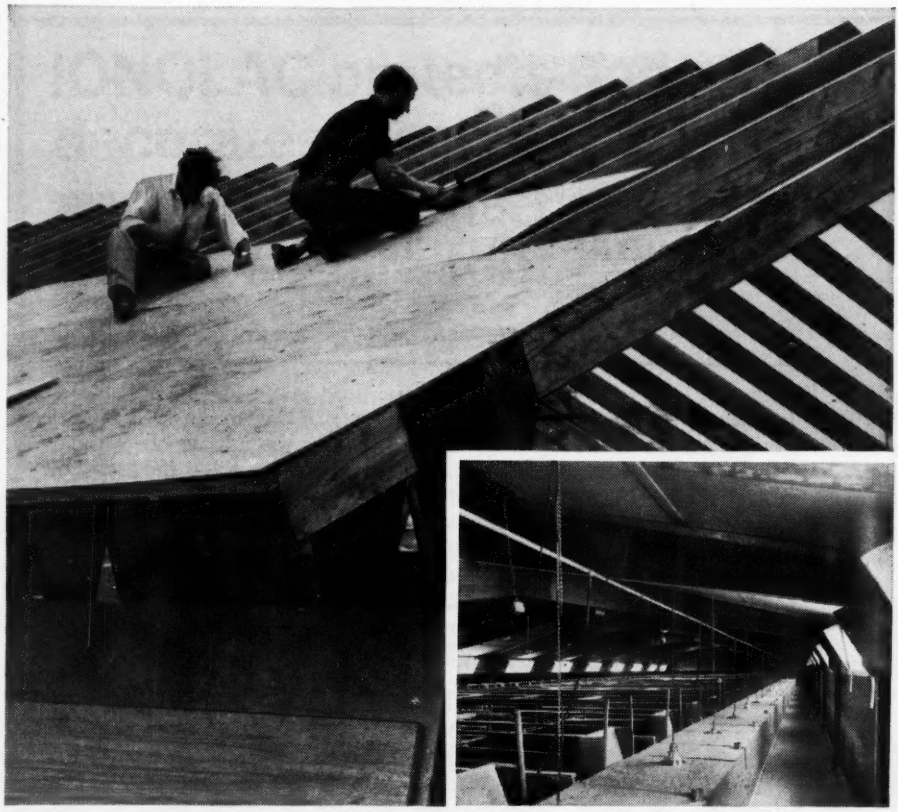
So far as cubicle housing was concerned, it has already been noted that this type of housing was generally occupied for a shorter period than the more conventional strawyard. The recommended cubicle bed area of about 28–30 sq. ft was adhered to in all cases, but the amount of sawdust, where used for bedding, showed wide variations. The range was from 0·9 lb to 4·0 lb per day, on average 2·0 lb.

The time recorded for 'servicing' ranged from 0·15 man mins to 6·0 man mins per lb of sawdust used. The best evidence available suggests that the optimum ranges between 0·6 and 0·9 lb daily.

Obviously a great deal must depend on individual circumstances. But it does seem that large savings could have been made in costs, and a lot of effort avoided, by stricter attention to points of detail, particularly in those herds with less than 100 cows.

Conclusion

That high cost labour should be used efficiently is a common enough statement these days and there is no doubt that this aspect was being carefully watched in most of the units seen. But, as has been observed above, there still remains plenty of scope for an even more intensive review of the methods, tools and equipment in use at any time. The study of work does not mean only this. The really valuable savings could have accrued long before the enterprise was actually begun. The survey has considerably reinforced the necessity for much more thought and consultation at the planning stage —it really does pay.



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J. D. Young, Liason Officer at the
Farm Buildings Centre, Stoneleigh,
talks about building development at the

National Agricultural Centre

THE decision of the Royal Agricultural Society of England in 1962 to settle on a permanent site at Stoneleigh in Warwickshire was a brave one with far-reaching consequences. Although the Royal was by no means the first show to have a permanent site, it had always relied on countrywide support and many felt that a permanent site, however central, would alienate much of this support. Certainly attendance figures at Stoneleigh have not reached the heights attained in some centres previously, but it seems that from the Show point of view, the move has been economically successful. However, the real benefit which has grown from the permanent site has been the development of the demonstration areas and the growth of the National Agricultural Centre concept. Although the Royal Show is by far the most important event in the Centre's calendar, the year-round activities will assume greater importance as the demonstration areas develop and more organizations have their permanent offices there. Already, interested farmers come back to the N.A.C after the Royal Show to take a detailed look at the demonstrations, or to attend the conferences, study days and seminars which are regularly organized.

For the farm building enthusiast, the 250 acres at Stoneleigh contain the widest selection of agricultural buildings to be found in such a small area in this country and probably in the world. Nowhere else can the visitor see such a variety of buildings for pigs, cattle, poultry, sheep and calves under commercial stocking management. He can also see the latest in electrical equipment at the Electro-Agricultural Centre, visit the display of building materials at the Farm Buildings Centre and study the wide variety of structures and materials exhibited permanently throughout the showground. Many of the non-agricultural buildings at Stoneleigh interest the specialist, particularly the new indoor arena at the National Equestrian Centre. Those enthusiasts who watch the events in T.V. programmes may be interested to know that this building of steel tied-portal construction is 220 ft long by 100 ft clear span width and that the roof is of blue translucent sheeting supplied in 52-ft long sheets.

A number of independent organizations as well as leading agricultura manufacturers and traders are co-operating with the Royal Agricultural Society in sponsoring and running the permanent demonstrations. Al demonstration units have a certain degree of autonomy which enables them to develop along different lines and thereby add interest for visitors. Most units attempt to demonstrate good current practice in livestock management

in as wide a range of buildings as possible. Although the National Agricultural Centre itself does not engage in research it is prepared to demonstrate prototype buildings to test their performance when stocked. The buildings are costed in detail and these costs are related to the performance of the livestock within the buildings. This work is not intended to produce a 'best buy' but to give factual details which will enable the farmer or designer to choose the system best suited to his particular conditions.

Farm Buildings Centre

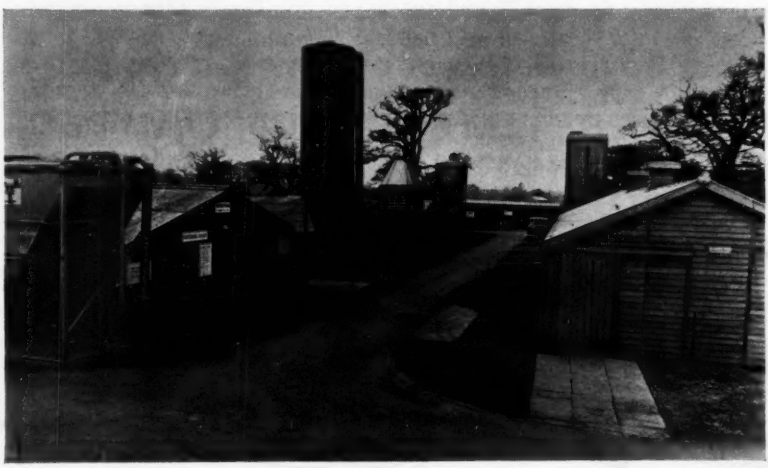
The Farm Buildings Centre is the hub of the building activities on the demonstration areas. A member of the Centre's staff, seconded from the Agricultural Land Service, is involved with all farm buildings on the demonstration units and co-ordinates the constructional projects. The Centre advises the N.A.C. on the current trends in farm buildings and on new materials available, and assists in the preparation of detailed plans and supervision of work in progress. On completion of the new buildings, the Centre's quarterly Farm Buildings Digest publishes details of the construction, costs and planning data. Once the buildings are occupied, recordings are made of humidity and temperature over a long period and observations made of the structural performance of the various materials used in the buildings. In this way, the Farm Buildings Centre aims to provide those designing and erecting new buildings with the type of concise, factual data that they require. The Centre has a library devoted entirely to farm buildings which may be used by subscribers to the F.B.C.

A display is being assembled in the Farm Buildings Centre's own Exhibition Unit with the intention of providing a comprehensive selection of the building materials used in agriculture. Information sheets are being produced to enable the designer to compare the relative advantages and limitations of the various materials. There is also further exhibition space which is devoted to changing displays on building subjects not easily demonstrated elsewhere at the National Agricultural Centre. The three buildings comprising the exhibition unit are of timber, steel and concrete construction with a variety of cladding and roofing materials. The concrete floors are treated with various industrial finishes likely to be of interest to the designer. Although the exhibition buildings are not of a type normally found on the farm, they illustrate the uses to which the basic materials can be put. The timber building uses a great deal of oil-tempered hardboard and plywood, both of which will be used increasingly in agricultural buildings. The permanent buildings on the Ministry of Agriculture's stand adjoining the demonstration areas are also constructed of steel, timber and concrete.

The Pig Demonstration Unit

The Pig Demonstration Unit was the first to be assembled at Stoneleigh and has now started on its third complete redevelopment. The unit began in the original Farm Buildings Area in what is now the Town and Country area, and most of the specialist pig buildings and general-purpose buildings are still there although not now stocked. The pig demonstrations soon outgrew their quarters and a new site was established on the perimeter. The unit now contains a wide variety of the type of buildings available to pig producers throughout the country. There are two different dry sow yards and a sow

stall house, a maternity house with a variety of farrowing crates, and five other farrowing and rearing houses. A weaner pool of cheap home-made construction houses the young pigs in groups of 50 or so before they are moved to one of three specialist fattening houses. The opportunity to see a commercially managed 100-sow unit in a wide variety of buildings attracts visitors from all over the country and from abroad. The unit has pioneered the development of the weaner pool and the use of $\frac{1}{2}$ in. fully compressed asbestos sheets for walls. Early work showed that intensive piggeries without straw bedding required a higher standard of management than simpler structures with adequate bedding; this was appreciated by the manufacturers of intensive piggeries who were able to avoid misuse of their products. A programme for the complete redevelopment of the unit has just begun, and a sow stall house for 48 sows and 2 boars, and a sow yard building for a similar number of sows and boars, with individual feeders, are being erected. The intention is that these two buildings will enable true comparisons to be made of the performance of sows housed in groups and with those housed singly. Re-development in subsequent years will cover farrowing accommodation, rearing and weaning pens and fattening houses.



Pig Demonstration Unit at the National Agricultural Centre

The Calf Unit

The Calf Unit demonstrates the rearing of calves to approximately three months of age in a variety of buildings. The youngest calves are housed both singly and in groups in four different buildings—a controlled environment house with both pressure and extraction ventilation, a converted Dutch barn, a proprietary round building and a straw-bale 'shack'. In spite of the wide variety in housing conditions and costs, there is little evidence of improved performance justifying the expensive buildings. At five or six weeks old the calves are moved to open fronted hardening-off pens. These pens are of a similar size and shape and constructed in a variety of ways from concrete blocks and asbestos through converted cow kennels to timber and polythene.

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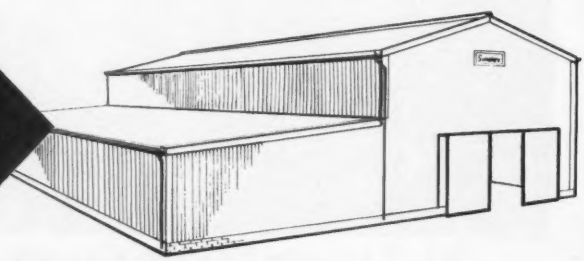

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The Beef Building

Alongside the calf area is the prefabricated beef building erected three years ago. This building was a prototype of a purpose-made shell constructed of light rectangular hollow section steel framework roofed with corrugated galvanized steel. The walls consist of removable panels of oil-tempered hardboard on a timber frame retained by steel channels. Although some snags have been encountered with the building, it is felt that the interest shown in it and the experience gained have justified the decision to erect an untried design. There are few places in this country where oil-tempered hardboard has been in continual use in a beef building for three years, and its performance is watched with interest. Low-level slats were tried in one side of this building but these have now been removed because of the difficulty of removing the dung from underneath them. Some trial cubicles were also installed and proved satisfactory. Future plans for the Beef Area are still under discussion but the aim is to provide simple, adaptable housing, costing no more than £30 per beast including services.

The Sheep Unit

With the Poultry Unit temporarily closed and the Dairy Cattle Centre not yet constructed, the only other stocked demonstration unit at the present time is the Sheep Unit. Although this unit is in its infancy it already has a great deal to interest both the sheep farmer and the building designer. A prototype plastic-covered, fully demountable structure costing 8*s.* 6*d.* per sq. ft was erected last April and its performance is being watched with great interest. The basic framework of rectangular hollow section steel is immensely strong but the life of the nylon-reinforced plastic sheet is not yet known. The main sheep house, completed in February this year, is of simple construction using timber and galvanized steel with oil-tempered hardboard cladding. One half of the building has a hardwood slatted floor whilst the other half will be strawed. The main framework and cladding cost 5*s.* 8*d.* per sq. ft. erected, but the total overall cost, including site levelling, concrete, slats, hay boxes, water and electricity, was 11*s.* 4*d.* per sq. ft. This is not as low as the do-it-yourself enthusiasts would have us believe but it is certain that the building will create great interest, and there is scope for cost reduction by a greater use of second-hand materials. The unit will be completed with the construction of handling pens and the erection of an exhibition building.

Visiting

Apart from the livestock demonstration areas, there is a great deal of interest throughout the showground. Some of the trade associations already have permanent stands and others are planned. Some manufacturers leave their buildings up all the year round and the Country Landowner's Association generally has a permanent exhibition of interest to the surveyor as well as to the landowner.

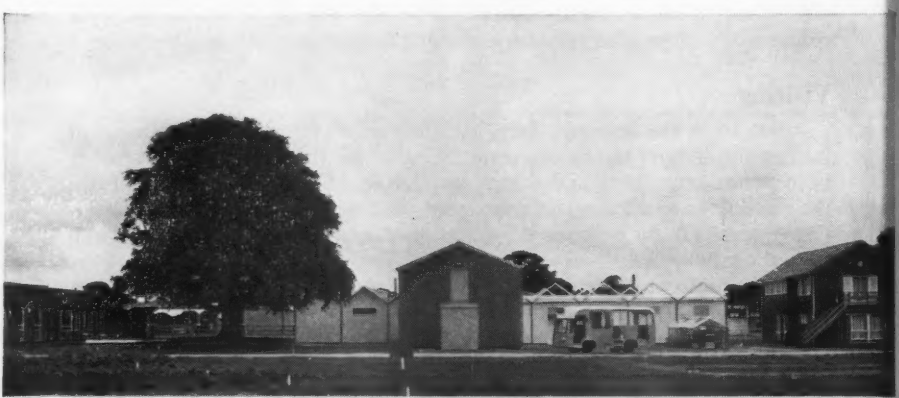
Those wishing to visit the National Agricultural Centre are requested to make an appointment to come on a Viewing Day when all the demonstration areas are open and the staff are on hand to answer any questions.

The photograph on the front cover is of the Royal Showground, Stoneleigh, Kenilworth, Warwickshire.

The Electro-Agricultural Centre for all advisers

This Centre is a permanent part of the National Agricultural Centre at Stoneleigh. It affords a display of fundamental techniques in the use of electricity in agriculture, as well as providing conference and training facilities. In addition, there is a technical and product information library, and adequate provision for demonstrating new equipment.
This Centre has been established by the Electricity Council to help all concerned keep up to date with the latest electrical developments in agriculture. It operates in conjunction with the Demonstration Areas of the N.A.C. where electrical methods are widely demonstrated as part of the many new farming techniques.
Advice and information about electric farming methods is freely available from the full-time specialist staff in attendance. Facilities for training courses and conferences are available for use by recognised agricultural organisations. The Centre is designed to meet the needs of all sections of the agricultural industry and to assist farmers in their efforts to increase productivity and cut costs.

For further information contact your County or Regional Office, or Mr.R.G. Scott at the Centre.



The Electro-Agricultural Centre, Kenilworth, Warwickshire, CV8 2LS. Tel: Coventry 27338 or Telex: 31543

Issued by the Electricity Council, England & Wales

Subsoiling not only increases yields but also increases efficiency in the use of fertilizers. The authors, who are soil scientists with the N.A.A.S., discuss the advantages of subsoiling on certain types of soils

Subsoiling

R. W. Swain **R. Thomas** **R. C. Little**

SUBSOILING is necessary wherever there is an impervious layer or pan within the soil profile at or below normal ploughing or cultivation depth, and under these conditions it is the key to easier soil management and higher yields. The effect of a pan is to slow down the downward movement of water resulting in waterlogging during wet periods and a reduction in the quantity of water passing to subsoil storage; it also reduces root penetration, so that the plant cannot explore the full depth of the soil for water, air and nutrients.

What causes these impervious layers?

Pans are formed either naturally or by the farmer. Natural pans result from downward movement of clay particles which form a seal at a certain horizon, or from the accumulation of iron compounds forming an 'iron pan'. Farmer-made pans are formed by continuous cultivation to the same depth or by cultivating soils when they are too wet, as is often the case in wet autumns such as 1967 and 1968. These pans are often formed at plough or rotavator depth, due to the smearing action of the implement across the natural structure cracks and fissures. Wet soils can also be compressed and consolidated by the passage of heavy machinery such as combine harvesters, or smeared layers can be caused by spinning tractor wheels.

Unfortunately, the number of pans formed in these ways are increasing because of the tendency to cultivate soils under adverse conditions—a result of the pressures to meet drilling and harvesting schedules over a large acreage. The introduction of all arable rotations, and the consequent gradual fall in soil organic matter levels are often to blame for the increase in structural problems. However, this is only one of the factors, as damage can be done on any type of soil, including sands, and in any rotation if the timing of cultivations is wrong. The wrong time for cultivations occurs more frequently on the slower draining silt and clay soils than on freely drained sand. Soils containing low organic matter levels are less stable than the same soil at high organic matter levels and are thus liable to more frequent structural breakdown.

How to recognize a pan

These layers can be detected by digging. The impervious layer is harder than the surrounding soil and contains less spaces between the lumps of soil. The number of roots in the layer is often considerably less than in the high layers, and in extreme cases no roots at all penetrate into the layer. Roots can often be seen to grow downwards to the top of the layer and then grow along its upper surface. In very wet conditions, or where organic matter such as straw or farmyard manure have been ploughed in, a bluish grey colour develops in the soil at plough depth. The impervious layer can range in thickness from a fraction of an inch to up to six or seven inches.

How are these defects remedied?

Weathering processes, such as alternating wetting and drying conditions, frost and plant roots, help to improve damaged structure, but these mostly affect the surface soil layers; the remedy to the deeper pans is the correct and timely use of the subsoiler.

The subsoiler depends on the effect of a narrow, 2–3 inches wide tine being drawn through the soil at an angle, which shatters and disrupts the pan and fractures the whole depth of soil from the base of the tine to ground level. This helps to create cracks and fissures in the soil through which water, air and plant roots can pass. Ideally, subsoiling should only be carried out when the subsoil is hard and dry, giving maximum shatter of the pan and lifting of the soil to several feet either side of the line. The shattering extends to a distance on either side of the tine equal to approximately twice the depth of subsoiling. These ideal conditions are most likely to occur in early autumn following a dry summer. Walking behind a subsoiler working in such conditions the whole of the area around the tine can be felt to move. The depth of treatment should be from two to three inches below the panned layer.

Efficient subsoiling should completely shatter the layer that is restricting rooting and drainage, allowing water to pass down the soil profile into the tile drainage system or a freely permeable subsoil. Subsoiling thus reduces waterlogging, and it also increases a plant's ability to withstand drought by allowing deeper rooting. The type of subsoiling carried out should be related to the thickness, strength and depth of the panned layer, to the type of cropping, to the gradient of the field and to the location of the existing drainage system.

Subsoiling under wet subsoil conditions fails to shatter the soil and results in the formation of a channel, similar to that drawn by a mole plough. In certain soil types, with a clay subsoil in which the channel does not readily collapse, the end result is similar to that obtained by mole ploughing, i.e., movement of water is horizontally away from an area rather than vertically down the soil profile as is the aim of subsoiling.

Is subsoiling worth while?

The need for factual data on subsoiling on which to base advice on pan and compaction problems has led to a number of observation studies and experiments being carried out by N.A.A.S. Soil Scientists.

Many earlier attempts to determine the value of subsoiling proved inconclusive because of a failure to study the precise conditions before and after

treatment; often no consideration was given to whether or not there was a real need for subsoiling in the fields chosen for the experiment.

Throughout the country eighteen observation studies and twenty-four experiments designed to cover a wide range of soil conditions have been carried out by the N.A.A.S. since 1963. The average responses to subsoiling in the experiments are given in the table below.

Yield increase due to subsoiling (cwt/acre)

Soil texture	Crop	No. of Experiments	Average response in years after treatment		
			1st year	*2nd year*	*3rd year*
Soils lighter than loam	Cereals*	8	2·3	4·1	4·2
Soils heavier than loam	Cereals*	9	1·8	1·9	1·1
	Grass†	7	6·7	4·0	1·0

*Yield of grain corrected to 85% dry matter

†Yield of grass expressed as dry matter

The effects of the experiments on light soils were largely concerned with natural impeding layers such as iron pans and limestone bands, which tended to reduce rooting and cause the crop to suffer severely in drought; the effects on heavier-textured soils were concerned with both natural and farmer-created layers which were causing waterlogging of the soil. This difference in the nature of the problems accounts for the continuing response to treatment on the lighter soils where the natural impeding layers tend to re-form only slowly, and for the diminishing response on the heavier soils where, after three or four years, the farmer-created layers were returning to what they were before subsoiling.

Subsoiling increased yield at most of the experimental sites to an extent to have covered the cost of the operation.

In addition to higher yield as a result of subsoiling, the efficiency of utilization of fertilizers is also increased. On an area receiving no fertilizer and no subsoiling the yield of dry matter of grass was 32 cwt/acre, nitrogen (60 units/acre) increased the yield by 15 cwt/acre, and subsoiling increased yield by 6 cwt/acre. However, the combined effect of subsoiling and nitrogen increased yield by 27 cwt/acre, giving an increase of 6 cwt/acre from the combined effect.

In addition to the information on yield, other measurements and observations were made on the experiments and on other aspects of the improvement in the soil condition. Two facts which tended to reduce the responses were noted in the course of this work. When the treatment was carried out on grassland under slightly wet conditions the tractor and subsoiling tine caused considerable damage to the sward, which took up to two years to return to normal. Secondly, on sites where the treatment failed to cause complete shatter of the impeding layers, yield responses were smaller than would have been expected. These observations high-light the importance of subsoiling at the correct time and in the correct way to suit the soil conditions.

Records of the height of the water-table were kept on several sites and showed that the level was appreciably lowered by subsoiling. For example,

on the undrained soil which had not been subsoiled, the water level was within 12 inches of the soil surface for 129 days in the year, whilst on the subsoiled land it was at this level for only seven days. The infiltration rate of water into soil has been increased markedly by subsoiling, for example, almost doubled in the case of silt loam. Water movement through the soil has also been increased by subsoiling.

One would expect the marked change in the soil water régime effected by subsoiling to be reflected in ease of working the land. Observations show that on grass the grazing season was extended by two to three weeks both in spring and autumn, and that poaching was reduced; on arable land the ease of working was improved, and soils could be cultivated and drilled earlier, and less panning was caused by machinery.

The actual cost of subsoiling varies with soil conditions. Taking a typical example of an artificially created pan at 12 inches, which necessitates subsoiling to 15 in. depth at 3–5 ft intervals, the cost would be £3–£4 per acre. This cost will be more than recovered by the increase in yield (as shown in the Table on page 292) without taking into account the other advantages such as greater flexibility in working, and extended grazing.

Subsoiling and drainage

When the subsoil is impervious, subsoiling should only be carried out in conjunction with a tile drainage scheme, preferably when a porous back-fill has been placed over the tiles and the laterals are more widely spaced. The Ministry now pay grant on subsoiling when this is carried out as part of an approved tile drainage scheme. Subsoiling should be at right angles to the laterals and deep enough to contact the back-fill. In the absence of the tile drains it should be done at 45 degrees to the direction of the slope.

There is little point in using expensive seed and fertilizer in areas where yield is limited because they lie wet or suffer from summer droughts because of restricted rooting depth, when in many of these cases subsoiling could cure the conditions. In the areas likely to suffer drought the rooting zone of plants can be increased, making them more resistant to the effects of drought, whilst in the heavier rainfall areas the water-table can be lowered and drainage generally improved.

Advice

Subsoiling should be used to break up natural and farmer-made pans in the soil; by doing so it can reduce the effects of drought by allowing roots to penetrate more deeply, help to avoid waterlogging, and increase the efficiency of applied fertilizers. It should be looked upon as a regular cultivation to repair damage caused by the power farming being carried on over the larger arable acreages on an increasing scale, and by the wet autumns such as those in 1967 and 1968.

R. C. Little, B.Sc., Ph.D., and **R. W. Swain, B.Sc. (Hons.)** are Regional Soil Scientists with the N.A.A.S. at Wolverhampton, and **R. Thomas, B.Sc.,** is a Regional Soil Scientist stationed at the N.A.A.S. Sub-centre, Starcross, Devon.

The author, D. D. Jones of the Radnorshire County Council, discusses the registration of common land and town and village greens

Commons Registration Act 1965

THE county and county borough councils of England and Wales (in London the Greater London Council) have undertaken this arduous task with certain trepidation. At best it could be nothing less than difficult, due to the very nature of the subject matter. What is this land, and what is the exercise all about? Briefly, it is the remnants of the traditional farming system of manorial times which has subsisted right down the centuries to the present day, involving the basic right of one or more persons to take as of right the natural produce of land belonging to someone else. Common land is therefore land encumbered with such rights. At least it was until the 1965 Act brought within its edict wastes of the manor that carry no such rights. Moreover, other land which prior to the Act was considered doubtful is now included, namely, land on which the common-right holders enjoyed their rights to the exclusion of the owner of the soil, or as stated in the Act, 'rights of sole or several vesture or herbage and rights of sole or several pasture'. Any doubts are now removed and accordingly such rights should be registered.

What is the object of registration? Pressure on land is increasing, and common land, shackled as it is, is a much under-used resource, but before any considered policy can be devised for its better management it must be known how much there is, who owns it, and who has rights over it. It is not proposed here to dwell upon the mechanics of registration as such, as by now they should be well known. It is sufficient to high-light some of the difficulties encountered in the exercise and some of the hazards inherent in it, unless the utmost vigilance is displayed by all parties in the period set aside for objections.

Administration

Within the context of the regulations, registration authorities were free to initiate their own procedure and, for the record, subject to their overall responsibilities, their main duty was to register properly completed applications—full stop. However, it was plainly apparent at the outset that in order to complete their task competently and expeditiously, full co-operation

would have been required from all concerned. In Radnorshire the task was entrusted to the agricultural and estate management department. This may or may not have had any merit. However, as the work was so involved it was considered necessary to streamline it as far as possible, and to lay the emphasis on its grass roots.

Registration of land as common

Despite certain dangers inherent in deciding what land is common and registering it as such, this task was mainly undertaken by the authority, the boundary lines being agreed with the common-right holders and the owners where known. This obviated the need for formal applications and the requirement for plans to be submitted, the register units being arranged to coincide with the area represented by each commoners' association as far as possible.

Registration of rights

The registration of rights, undoubtedly the most difficult part of the exercise, needed special attention, being in these parts mainly *sans nombre* and these had to be quantified. In such cases the principle of levancy and couchancy is held to apply, that is to say, that the extent of the right depends on what stock the in-by land would support by its produce during the winter months. However, as farming systems became progressively more sophisticated, so also has this principle receded into history and is out of date today. The rights had to be quantified, however, and some means had to be found that would at least ensure uniformity. The authority became quite involved in this, and meetings of commoner's associations were attended with the object of giving all practical assistance. Normally, a formula would be produced based on the area and the stock-carrying capacity of the common land, related to the area of freehold land with rights attached. The general pattern was that at the first meeting the area of the common land concerned was delineated, its stock-carrying capacity in its present condition assessed, and the total area of the freehold land with rights attached calculated. Sometimes an attempt was made to apportion the rights, but invariably this was left to a second meeting. To close the chapter, a third meeting was held to scrutinize applications and complete the forms where necessary, and by pre-arrangement a Commissioner for Oaths or a Justice of the Peace was present to attest the statutory declarations. (If it was a J.P., it was naturally one who had no vested interest in the area concerned). Again, to obviate the need for submitting 'supplemental' plans, 1/2500 ordnance survey maps were provided to enable the enclosure numbers of the freehold land to be included instead. This proved of distinct value, especially where the freehold land had to be apportioned when rights were claimed on more than one register unit. This joint involvement benefited not only the commoners' association but also the registration authority in that abortive work was reduced to the minimum, e.g., the returning of incomplete applications, etc. To prevent any ambiguity in future, the type and class of stock registered has been clearly defined. It should be made clear, however, that although the authority has been very much involved, the decisions made were entirely those of the associations concerned.

Inclosure awards

During the last century a large amount of common land was inclosed by awards made under both public and private acts, and much of this may still appear to the onlooker to be common land. To obviate its abortive registration its boundaries have been outlined on a 2½ in. to the mile county map, and the areas shown in distinctive colouring. Similarly, all common land when registered is shown in a different colour. This gives a visual appreciation of the position. Much useful information has been gleaned from the awards, e.g., where allotments made thereunder are contiguous to common land, the precise boundary lines can be determined. Certain evidence as to who may or may not have rights of common is available, together with information about allotments awarded to private individuals and those to the local inhabitants, such as those for fuel, turbary, quarries, watering places, field gardens, and recreation, the latter being registrable as town or village greens. Superficially these may still appear to have common rights, but this is not so, unless for some reason a prescriptive right has been acquired since. Incidentally, the Charity Commissioners are concerned that such land may be registered mistakenly.

Registration of ownership

Ownership can only be registered where the land has already been registered as common or a town and village green, and not registered under the Land Registration Acts 1925 and 1936. Where no ownership is registered, however, the registration authority is bound to refer it to the Common Commissioner to ascertain ownership.

'Noting' of private rights and interests

Applicants were advised against making *ad lib.* applications for the noting of private rights and interests, these being largely confined to those who would not otherwise have their names in the register, e.g., sporting rights alienated from ownership, private rights of way to properties situated on common land but having no right of common, owners of minerals where severed from ownership, etc. This was considered desirable to avoid confusion and distraction from the main purpose of the exercise.

Town and village greens

There appears to be some confusion as to what land should be registered as such. Firstly, it must be land which is used for lawful sports and pastimes, and secondly, used for such purposes as of right by the local inhabitants, the right having been acquired by custom, prescription or specifically allotted for exercise and recreation under an Inclosure Award. Land acquired under other acts, e.g., the Physical Training and Recreation Act 1937 does not come within the definition. Roadside waste is excluded from the definition of common land, but not from that of town and village greens. Final registration of such land, as such, will be conclusive proof that it is town or village greens, and the ownership will be vested in the parish council concerned, unless otherwise registered.

Scrutiny of registrations

The opportunity to test the validity of registrations is an integral part of the exercise. Those not contested will have full legal force at the end of the respective objection period and it is imperative, therefore, that where there is any doubt, formal objections should be lodged. The parties will be given an opportunity to reconcile their differences themselves, and only if they fail will the disputes be referred to the Commons Commissioner. Some of the difficulties that have arisen and are considered to be pertinent are:

1. where an allotment has been awarded in lieu of rights under an inclosure award, it is contended that the farm has no further rights of common, unless acquired since; or where the allotment is contiguous to common land when the intercommoning rights (if any) may still be exercisable: where, however, such an allotment has remained open, further prescriptive rights may have been acquired over it and the land may now be common;
2. encroachments may still be common land: if not, similar observations as above will apply;
3. where rights are claimed, but have not been exercised, they may be presumed abandoned unless a contrary intention is proved: even where title deeds confer unlimited rights their extent has to be proved on user;
4. where claimants have grazed additional animals, because some common-right holders have not exercised their rights and registered increased rights accordingly;
5. where rights are claimed when the land carrying the right has been divorced from farming, e.g., afforestation;
6. where additional rights are claimed by reason of vicinage, numbers should still be limited to those applicable to the home common;
7. where the land carrying the rights has not been apportioned when rights are claimed on more than one register unit.

It is important, therefore, that the validity of all registrations be carefully scrutinized, and that diffidence and reluctance should go by the board, and objections lodged where justified. No time is better than the present, and it should not be put off. Registration authorities will not be able to become so involved in this part of the work.

Objection procedure

The drill is much the same as for registrations, except that objections need not be attested. Forms are obtainable from registration authorities, and contain copious notes and examples. Space does not allow for elaboration here but dates to observe are: *30th September, 1970*—end of objection period for *registrations* made up to *1st July, 1968; 2nd January, 1970*—end of final registration period; *30th April, 1972*—end of final period for objections.

In conclusion, tribute should be expressed to the N.F.U., the Ministry of Agriculture, Fisheries and Food, the Land Commissioners and others who have helped in the task of registrations in various ways.

This article has been contributed by **D. D. Jones, F.L.A.S., F.R.V.A.,** Chartered Land Agent, who is County Land Agent and Valuer to the Radnorshire County Council. His previous appointments included that of a District Officer of the Agricultural Executive Committee in Carmarthenshire and Radnorshire (1946) and subsequently, until 1950, with the Agricultural Land Service of the Ministry of Agriculture, Fisheries and Food.

24. Sevenoaks, Kent

A. Page-Wood

WEST Kent must be one of the most visited and least seen districts in the country. To most visitors it conjures up frustrating drives along the A2, the A20 or perhaps the A21 to the channel ports or the East Sussex coast. Similarly, the names of Tonbridge, Sevenoaks, Westerham and Swanley are all associated with long traffic jams although gradually these bottlenecks are being eased as new by-passes are opened.

Yet the Sevenoaks district, although never far from the roar of traffic is an area of charm and variety. In fact if anything characterizes the district, it is its variety. The topography, of alternating ridges and low-lying clay valleys, the variation in rainfall and the climatic influence of the Thames Estuary, leads to great variety in the type of farming practised. The presence of London with its vast commuting population also has its effect, although this is much less than might be expected.

Two rivers are of great importance to the district; these are the Thames, which forms the northern boundary and the Medway, with its tributary the Eden, which drains the southern half of the district, often much too slowly for farmers on the surrounding heavy land. The Medway is liable to flooding, sometimes two or three times a year, which limits the farming potential of some of the farms lying along its banks.

Agriculturally the district can be divided by two main roads. The A25 cuts across the district from east to west and the A21 from north to south. Most of the land north of the A25 lies over chalk and more recent geological formations. These vary widely and consequently there are many changes in soil type. In this area there are several dormitory towns and villages, although some of the best farms in the district can be found here. Crops grown vary enormously but dairying, often on a large scale, is common and several farmers have successful retail milk rounds in the surrounding towns. Further north and east vegetable growing becomes pre-eminent, partly because of the ameliorating effect of the Thames Estuary on the local climate; whilst the Swanley area was at one time very well known for its glass, the acreage has fallen from over 300 acres to approximately 60 in recent years.

The area to the west of the A21 has great charm. It is bounded both north and south by wooded sandstone ridges with a central low-lying area of clay through which the rivers Medway and Eden flow. Among the well-known places of interest are Chartwell, Hever Castle and Penshurst Place and beauty spots include Toys Hill and Chiddingstone. Farming is centred round the dairy cow and nearly half of the district's 14,000 cows are to be found here. The herds tend to be large and most of them are expanding in size, some very rapidly, to two hundred or more cows.

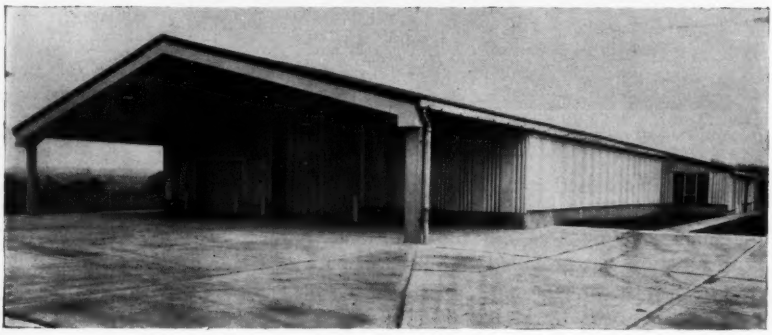
The greater part of the land is in grass and very often this is extremely well managed. To most farmers drainage is a great worry and cereal yields fluctuate enormously, usually in direct relationship to the spring rainfall. Poor drainage and heavy stocking lead to another major problem, that of disposing of farm effluent. The difficulties are aggravated by the presence of the two rivers, one of which is being used to supply a large reservoir now being constructed at Bough Beech, to supplying water to the expanding town of Edenbridge.

The third part of the district opens into the true Garden of England. It is the area to the east of the A21. Here the lower land is covered with deposits of alluvium and brickearth and the sandstone area to the south becomes of greater importance, the well-known High Weald. The further south and east one goes the better the soil and the higher the proportion of land used for hops and fruit. In this district, about 13 per cent of England's hops and 5 per cent of its fruit are grown, about half of which come from the three adjoining parishes of Capel, Brenchley and Horsmonden. This is because of the presence of deep well-drained soils to be found on the Tunbridge Wells sand. In spite of their great economic importance hops and fruit only occupy one third of the land and the remainder is largely in grass, although cereals and other crops are grown. Livestock consists mainly of sheep and beef cattle and dairy herds are scattered and generally small in number. Farming naturally revolves round the hop garden and the fruit orchard with their very heavy demands on capital, labour and, by no means least, on management skill. Other enterprises must, of necessity, require as little as possible of these resources and be capable of utilizing the poorer classes of land in the area.

The great variety in the district leads to many paradoxical situations. One farmer's main worry may be concerned with slurry disposal, whereas a few miles away, another may be trying to organize a farming system which will maintain the organic status of the soil. Highly calcareous soils are to be found with consequent problems of trace element nutrition within a short distance of extremely acid soils. Irrigation problems and difficulties with flood control lie side by side often on the same farm. Most of the district has a moisture deficit of several inches through the summer and at that time water is usually in short supply. The farmer has to struggle with the management of highly-intensive cropping combined with more extensive cereal or livestock systems. He must also endeavour to keep his fixed costs down to a reasonable level at a time when these are rising rapidly, often to fifty or sixty pounds an acre.

Perhaps when the reader takes his next holiday to the Continent or Sussex he will pause, take one of the many side roads and enjoy the beauty of West Kent where its greatest farming glory is its endless variety.

Designing a Horticultural Packing Shed



R. E. Howse, *Agricultural Land Service, Maidstone*

THE Glasshouse Crops Research Institute, Rustington, Sussex, required a packing shed to give adequate cover and protection for handling crops of tomatoes, cucumbers and flowers from approximately four acres of experimental glass. It was decided that a building to meet the Institute's requirements should comprise a steel portal frame, giving a clear span of 60 ft and a total length of 120 ft, including a 20-ft covered loading area with a lean-to 40 ft × 11 ft, providing office and toilet accommodation for both sexes; also that the roof cladding should be of sandwich construction. To meet the requirements of the Planning Authority, slate-coloured 'Big Six' sheets were used externally, these being separated from the asbestos lining panel by ¾-in. tanalized battens, with 1 in. of glass fibre between. To provide adequate natural light in the main packing area, one-twelfth of the roof was double glazed with clear plastic sheet.

A 2-ft dwarf wall of 18 in. × 9 in. × 6 in. concrete blocks, laid flat and rendered externally, was constructed from floor level and from 9 in. below the top of this wall to eaves level the shed clad with natural colour asbestos panel sheets on the external face, with asbestos insulating board internally, the sheets again being separated with spacer battens and infilling of 1 in. of glass fibre. This enabled a good 'U' value of approximately 0·16 to be achieved, important in a building used for handling produce. Purpose-made

Internal view of the packing shed

filler pieces were used at the eaves and bottom edge of the vertical cladding to form a closure and prevent entry by birds. No windows were required in the main packing area but the additional natural light necessary in the flower section was provided with vertical patent glazing in the north wall.

Having regard to the purposes for which the building was required, great care was necessary in the composition and laying of the floor. It had to be a reinforced, waterproof, vibrated, monolithic slab, with a wearing surface of an average thickness of $\frac{3}{4}$ in. of granite aggregates, compacted mechanically with power floats. Contraction and construction joints in the base and topping concrete were made to correspond and were simple butt joints without fillers. The floor was laid level in the main packing area but with a fall to a continuous channel along the length of the flower packing section, protection against blocking of drains with stems, leaves, etc., being provided.

The flower section was separated from the main area by a gas-proof wall, to prevent possible damage to blooms by ethylene gas. The gas-proofing was achieved by rendering both sides of the masonry wall, following with three brushed-on coats of a proprietary insulating sealer, and finished in white with two coats of an acrylic emulsion paint.

Folding doors were provided where vehicles enter the shed and, as a visual aid to drivers, a 6-in. wide strip around each opening, the bollards and the two stanchions supporting the covered loading area were painted canary yellow which has proved most satisfactory.

All artificial lighting, including that in the loading area, was designed to eliminate both glare and shadows. Colour matching tubes giving a maximum of 30 lumens in the main packing area and north light tubes giving 45 lumens in the flower section were provided, and fitted to the underside of trunking fixed 9 ft above floor level. Power cables, with socket outlets were also fitted to the trunking to enable electric motors driving the graders, conveyors, etc., to be connected overhead, and the risks of trailing cables across or under the floors eliminated.

Thermostatically controlled, fan assisted unit heaters connected to the Institute's main steam supply and operating under steam at 15 p.s.i. were

provided overhead throughout the building, to maintain a temperature of 65°F (18°C).

Direct access from the office only to the packing area, was planned deliberately to obviate loss of working space.

Owing to difficult levels, a septic tank for foul drainage had to be designed to comply with the Local Authority's requirements but provision was made for all surface and rainwater to be carried to soakaways.

Two cool rooms were installed in the flower section to hold blooms overnight or at the weekend.

This building has now been in operation for approximately two years and has fulfilled the requirements of the Institute. The features of design and construction it incorporates might, however, well be followed by those considering the provision of similar accommodation for the handling of produce from roughly the same area.

More detailed information regarding the design of packing sheds for horticultural crops is given in Fixed Equipment of the Farm Leaflet 44, *Design of Horticultural Packing Sheds*, obtained from Her Majesty's Stationery Office, addresses on page 308 or through any bookseller, price 1*s*. 9*d*. (by post 2*s*. 1*d*.).

The Ministry's Publications

Since the list published in the May, 1969, issue of *Agriculture* (*p*. 223) the following publications have been issued.

MAJOR PUBLICATIONS

BULLETINS

Bulletin No. 135. Fruit Tree Raising (Revised) 12*s*. 6*d*. (by post 13*s*. 2*d*.)

FREE ISSUES

ADVISORY LEAFLETS

No. 74. Anthrax (Revised)
No. 226. Red Spider Mite on Crops in the Open (Revised)
No. 362. Examination of Bees for Acarine (Revised)
No. 414. Eelworms on Strawberries (Revised)
No. 517. Causes and Prevention of Losses in Calf Rearing (Revised)
(Previously Avoiding Losses in Calf Rearing)
No. 565. Rabbit Meat Production—Breeds of Rabbits (New)

SHORT TERM LEAFLETS

No. 14. Chemical Weed Control in Bush and Cane Fruits (Revised)
No. 52. Suggestions for Chemical Weed Control in Vegetables (Revised)
No. 84. Temperature requirements of the Cultivated Mushroom (New)
No. 85. Production of Apples on Tree Spindlebushes (New)

PROFITABLE FARM ENTERPRISES

No. 1. Rearing Friesian Dairy Heifers for Autumn Calving (New)
No. 2. Three systems for Beef (New)

The priced publications are obtainable from Government Bookshops (addresses on p. 308) or through any bookseller. Single copies of the free items are obtainable from the Ministry (Publications), Tolcarne Drive, Pinner, Middlesex.

in brief

- **Poultry business**
- **Two co-operatives in the potato market**
- **Fewer milk producers but more milk**

Poultry business

QUALITY rather than price is the final arbiter of consumer choice, and in an increasingly competitive market the producer has perforce to deploy his resources with this single aim in mind. This is one of the facts of economic life which has been made abundantly clear to the poultry keeper, whether the end product is eggs or meat. The days when we 'just liked to have a few poultry around the farm' are long since past. Such has been the spiral of specialization, promoted by technological development, scientific breeding and new feeding formulae, that today, with the laying flock nearly twice the size it was before the war, less than half of our farming units is sufficient to fulfil the home production of eggs, and a mere few hundred holdings to produce more than 80 per cent of our broilers and turkeys. Ninety per cent of our laying stock are now housed intensively, and, by automation's artful aid, the ratio of flock numbers to manpower, which under free-range conditions twenty years ago stood at 1,000 to one on big poultry farms, is now commonly six times that figure and indeed on some commercial units considerably higher.

The financial advantages that accompany the economies of scale are self-evident, perhaps deceptively so, but they are achieved only by meticulous business methods and frequent checking of input factors against financial and physical performance of the flock. Budgeting and planning must be oft-repeated exercises. A good deal of capital can be tied up in housing and equipment which, without a vigilant eye, can all too quickly fail to justify itself.

Thus all the modern emphasis is on managerial ability, and for this reason the Ministry's booklet* on present-day poultry management is one that is likely to repay study by most poultry farmers, whatever the particular area of specialization or even running small units on the general farm, when related to local conditions. Rough calculations and intuition are no substitute for a good recording system from which to prepare a final laying flock account, and that provided by the National Agricultural Advisory Service (described in leaflet STL 56, *Keep Your Own Poultry Records*†) is a ready-made guide to the profit potential lying between expenditure and income. Similarly, the help which the N.A.A.S. can give in the costing of broiler and turkey enterprises is well worth asking the local Poultry Husbandry Adviser about.

Management is by far the most important single factor in keeping a poultry business profitable, and it applies every bit as much to the moderate sized enterprise as it does to the mammoth specialist undertaking.

*_The Farm as a Business: 5, Aids to Management, Poultry_. Obtainable from H.M.S.O. price 2_s._ 6_d._ (by post 2_s._ 11_d._)

†Obtainable free from the Ministry of Agriculture (Publications), Tolcarne Drive, Pinner, Middlesex.

Two co-operatives in the potato market

PRODUCE amounting to over 10,000 tons a year comprising potatoes, carrots and sundry crops, is now being graded and marketed by the East Riding Farm Produce Ltd., a co-operative which began trading seven years ago. It bulk loads members' crops as grown and grades them centrally on the Society's premises as a strictly commercial operation. Good management, modest capital investment in the initial stages of development, central handling, good market outlets, efficient use of labour and a high standard of member loyalty have underwritten the success of this venture. Thought is now being given to peeling and pre-packing enterprises and for the Society's entry into wholesaling in a local town.

A feasibility study has looked at the rapidly expanding market for the canning and freezing of potatoes and carrots, but the capital investment would be high—£100,000 for each enterprise—and in the case of canned potatoes the creation of a sales organization capable of competing with existing products would pose a major problem. A more attractive idea may be for the Society not to involve itself in canning, but to consider supplying suitable produce to existing canneries. For frozen potatoes it is concluded that a low level of throughput would not justify the heavy capital investment and would not enable the Society to compete effectively with existing frozen food manufacturers.

A younger Society, in Suffolk, the Mendlesham Potato Co. Ltd., which started with six members in 1964 to grow, grade and market 150 acres of potatoes and was granted-aided by AMDEC in its formative years, is showing above-average yields (13·8 tons/ac in 1966–67) and price maintenance at levels similar to the district and national averages. The group makes the maximum use of labour, machinery and other specialized plant and markets the crop under the control of a manager. On the marketing side the Company has graded and dressed potatoes to meet the requirements of specific outlets. In 1964 processors were taking 24 per cent of the crop; in 1967 the figure had risen to 50 per cent.

Fewer milk producers but more milk

A record 2,141 million gallons of milk were produced from the dairy herds of England and Wales last year (April '67–March '68), which is 69 million gallons more than the previous highest peak of 1962/63—and this despite the severe foot-and-mouth epidemic which involved 210,000 cattle, of which 105,000 were dairy cows. Most of the increase came from higher milk yields resulting from plentiful summer grazing and a good hay harvest although, until the foot-and-mouth outbreak in late October, 1967, a marked rise in cow numbers also made its contribution.

In the first sixteen years of the Milk Marketing Board's operations the number of farms producing milk for sale increased annually to reach a total of 160,000 in 1948—a figure which was held until 1950. From then onwards, however, numbers fell off by 4–5 per cent annually until the end of 1966, but the decline has since moderated. Comparing figures for the past ten years, in March, 1958, there were 132,233 registered milk producers in England and Wales; in March, 1968, there were 89,101.

These figures are given in the latest report of the M.M.B.'s Breeding and Production Organization, which also looks to the future as being likely to favour specialization and concentration of milk production with still fewer production units. At the current rate of fall in the number of producers it is predicted that by the early 1970s the register will show less than 80,000. 'This net exodus of producers', says the report, 'means a dramatic change in the structure of the industry, with half the milk in the early '70s coming from herds of fifty cows or more, compared with nearly 40 per cent now and 30 per cent ten years ago, and the prospect of two-thirds of our milk coming from this sector of our national herd by the late '70s—with all the factors in the situation pointing to a quickening of the rate of change'.

AGRIC

Books

Sheep Husbandry and Diseases. (5th Edition). ALLAN FRASER and JOHN T. STAMP. Crosby Lockwood, 1968. 50*s*.

Knowledge, according to Webster, is the condition of knowing something with familiarity gained through experience or association. The well-known authors of this book, with their vast practical and scientific knowledge, cannot fail to stimulate the interest of all readers, be they students or farmers, in the humble sheep.

Fraser reminds us that present day sheep farming in this country and New Zealand is based on the fact that we eat far more mutton and lamb than other industrialized nations. The future of our industry, therefore, depends as much on promoting this 'good habit' as on technical developments. History has much to tell us and it is only proper that pride of place in the section on breeds is given to the Merino and the Longwools on which the world's sheep industry was based a few centuries ago. The rise and decline of breeds and types makes fascinating reading and should be studied by those itching to reduce our numerous breeds and crosses.

With economic pressures forcing traditionally managed sheep off expensive land, a fresh approach to the stratification set up is necessary, but it will still be true that 'expenditure must be carefully controlled if there is to be any reasonable profit at the end of it all'.

In this provocative book the real Allan Fraser, tongue in cheek and dirk in hand, comes to light when he castigates geneticists and other scientists for interfering with the breeding of sheep. Sheep farming requires champions for its cause but science is no longer the enemy of the progressive breeder! Figures may not be a substitute for observation but shepherds now have less time to lean on gates to watch their ever-increasing flocks. Yet, the modern shepherd and technician ought to heed the advice of Fraser and Stamp and cultivate the powers of observation. Ill-health can often be detected long before post mortems but Stamp reminds us that strong, well-grown animals are more susceptible to several diseases and require the protection of veterinary science. *G.L.W.*

Some Safety Aspects of Pesticides in the Countryside. Edited by N. W. MOORE and W. P. EVANS. Joint ABMAC/Wildlife Committee, 1968. 25*s*.

This book deals with the proceedings of a Conference held at the British Museum (Natural History) in London on 20th November 1967.

The Conference was held to review recent experience in the United Kingdom of the development, control and safe use of pesticides, and at the same time to launch a Code of Conduct for those who deal with, use or study their effects. Both Conference and Code were sponsored by a committee respresenting M.A.F.F., manufacturers, merchants, nature organizations—including the Nature Conservancy, and many other bodies. Whilst, no doubt, the Code will provide a useful guide and one hopes will be observed by those to whom it is directed, perhaps the most remarkable thing about it is that representatives of widely differing interests have been able to get together round a table and produce an agreed document.

The Conference papers vary greatly in origin and scientific content but, in essence, most cover the history of pesticide use in this country over the past ten to twenty years as seen through the eyes of the different interests. The first two papers deal with the cost and complexity of developing a new chemical and how its likely effects on wild life can be investigated. Two other papers are worth mention by virtue of their novelty. One gives some little known information on the extent of use of pesticides in forestry and the other deals with the value of pesticides as conservation and research tools and acknowledges the stimulus they have given to fundamental work in biology.

The report provides useful material for anyone interested in what one might almost call sociological aspects of pesticide use. It provides an excellent example to other countries, and perhaps other industries in this country, of the importance and value of collaboration between interested parties however divergent their views may appear at first sight. *H.C.G.*

Farm Animals. F. A. W. PEREGRINE, A. FOX, A. P. INGHAM and A. B. HUMPHRIES. Hutchinson Technical Education, 1968. 25*s*. (Paperback).

Publishers, printers, and binders have co-operated splendidly to produce the elegant format for this assembly by a team of authors, from the Lancashire College of Agriculture, of the principles of livestock husbandry. At the price and with the rapidly expanding numbers of part-time, short course, sandwich course, one- or two-year course students, etc., in agriculture this production will, no doubt, sell well. In the present age, most of these students seek some 'qualification' as proficiency tests, certificates at various levels, diplomas and even degrees. It is, therefore, useful to have available some text that provides all the answers, and at the same time provides examiners with a complete array of questions. Any student who has absorbed or memorized the contents of this book could reasonably expect to gain credit in any examination, at any level, in the basic scientific principles of animal husbandry.

The book is profusely illustrated by figures and diagrams, often too elaborate, not always relevant to the text, and never acknowledged. The authors have proved adept in recasting their own lecture notes to give 'ex cathedra' statements on basic principles. In this, they have skilfully avoided any marked misinterpretations of present knowledge yet have given a very patchy account of its implications. The idols of S.E., P.E., maintenance and production are well illuminated; newer concepts of feed requirements and the rapidly changing technology of animal production are almost ignored. There is an unfortunate imbalance throughout the work; six short paragraphs on page 35 describe the autonomic nervous system, which must be of little interest to practising farmers and stockmen. Yet in Section III, 'Breeding', some sixty pages are devoted to discursive and not always accurate or up-to-date discussion of genetics and its applications.

Unfortunately, there are no references or suggestions for further reading. *J.E.N.*

books received

Plum Main Cultivar Trial. (1955–66). National Fruit Trials. Copies from the Director, Brogdale Farm. Ministry of Agriculture, Fisheries and Food.

The Farm Economist. Vol. XI. No. 8. 1968. The Agricultural Economics Research Institute, Parks Road, Oxford. 10*s*.

Report of the Barley Committee. Trials 1966. European Brewery Convention. Copies free from The Institute of Brewing, 33 Clarges Street, London, W.1.

Agricultural Adjustment Unit.
(University of Newcastle upon Tyne) 3*s*. each (By post 3*s*. 6*d*.)

TP.1. *Organisational Possibilities in Farming.* M.A. Gregory.
TP.2. *Life Assurance in the Business of Farming.* Leo Menage.
TP.3. *Management Techniques for Reducing Costs or Increasing Revenues.* R. W. Helme.
TP.4. *Current Taxation Policies.* R. A. Bristow.
TP.5. *Insurance in Agriculture.* C. T. Jameson and J. Rawlings.
TP.6. *Budgeting and Budgetary Control.* J. C. Cole.
TP.7. *Capital Taxes and Agriculture.* C. Townsend.

Tourism and the Cornish Farmer. E. T. Davies. Report No. 173. University of Exeter. 2*s*. 6*d*.

Eleventh Annual Report. Pig Industry Development Authority. 1*s*.

Market Survey. (Cattle, Sheep, Pigs). Meat and Livestock Commission.

The Intensive Cereal Beef System using Calves from the Dairy Herd. Handbook No. 2. Joint Beef Production Committee. 3*s*. 6*d*.

Kirton Experimental Horticultural Station. Third Report 1966. Ministry of Agriculture, Fisheries and Food. Copies from the Director of Kirton E.H.S.

Bull. 6. *Farm Size Adjustment Unit.*
Bull. 7. *Capital Adjustment in Agriculture.*
Bull. 4. *The Elements of Agricultural Adjustment.* S. J. Rogers.

Copies from the Agricultural Adjustment Unit, School of Agriculture. The University, Newcastle upon Tyne.

Annual Report of Studies in Animal Nutrition and Allied Sciences. Vol. 24. 1968. Copies from the Rowett Research Institute, Bucksburn, Aberdeen, Scotland. 10*s*. (including postage).

Agricultural Chemicals Approval Scheme

Fourth List of Additions to the 1969 List of Approved Products for Farmers and Growers.

MECOPROP
Potassium and Sodium Salt Formulations
Ciba CMPP 48—Ciba

MCPA
Potassium and Sodium Salt Formulations
Ciba MCPA 40—Ciba

Company Information

Change of Address
Agricola Chemicals Ltd.,
2, Stratford Place,
London, W.1. 01-499 9722.

Angenol Ltd.,
Eagle Star House,
Honley Road,
Catford,
London, S.E.6. 01-698 9168.

J. D. Campbell and Sons Ltd., and
J. D. Campbell (Sales) Ltd.,
Liverpool Road,
Warrington,
Lancs. Warrington 33232/3.

Cleanacres Ltd.,
Andoversford,
Cheltenham, GL54 4LZ,
Glos. Andoversford 481/4.

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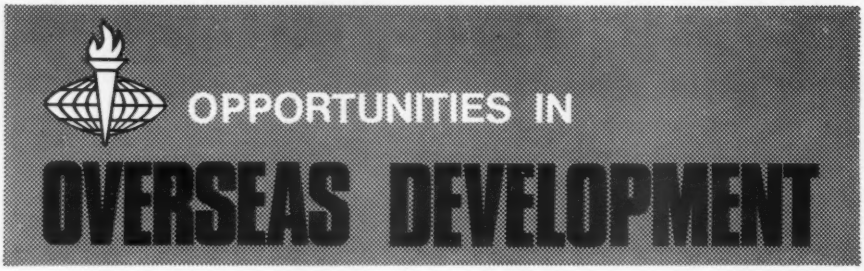
OFFICIAL APPOINTMENTS



General agriculturists and agricultural specialists of many kinds are frequently required in the effort to match the large demand from the developing countries. The vacancies advertised below are a selection from the many openings which exist now. While they are being filled, other vacancies are arising.

Salaries within the ranges quoted are assessed on qualifications and experience; and the terms of most appointments include free or subsidised accommodation, education grants, family passages, good leave on full pay, etc. A contributory pension scheme is available in certain circumstances.

Most appointments are limited to candidates who should be citizens of, and normally resident in, the United Kingdom.

BOTSWANA

Agricultural Officer (Development)

RC 213/19/022

Duties: To work under the Land Use Planning Unit in the planning and development of settlement schemes on state lands.

Qualifications: Degree in Agriculture or Natural Science, preferably with planning and development experience.

Salary: Basic R.2,256—4,400 (£ Sterling 1,316—2,590) p.a. plus an inducement allowance, normally tax free, in the range £360—£660 p.a. (payable direct to an officer's home bank account). Tax free gratuity 25% of basic salary only. Contract 2–3 years.

BRUNEI

Agronomist

RC 213/28/02

Duties: To draw up and advise on a programme for improving major crops.

Qualifications: Degree in Agriculture with tropical experience.

Salary: £1,992—£3,526 p.a. Tax free gratuity 12½% of salary. No local income tax. Contract 3 years.

GILBERT and ELLICE ISLANDS

Agricultural Officer

RC 213/72/02

Duties: To initiate a scheme of training to provide agricultural assistants, to organize various types of training overseas, and to act for other officers whilst they are on leave.

Qualifications: Degree in Agriculture with post graduate training and tropical experience of agricultural extension or training.

Salary: A$2,232—A$4,272 (£ Sterling 893—1,709) p.a. plus an inducement allowance in the range £716—£1,160 p.a., normally tax free (payable direct to the officer's home bank account). Gratuity 25% of emoluments. Contract 2 years.

OFFICIAL APPOINTMENTS

LESOTHO

Agricultural Officer (Botanist) *RC 213/18/09*

Duties: To undertake the organisation with farmers associations for seed multiplication and production of wheat, sorghum, peas, beans and potatoes; responsibility for the administration of the Seed Testing Laboratory at the Maseru Research Station.

Qualifications: Honours degree in Agriculture or Agricultural Botany essential. A post-graduate qualification e.g. Diploma in Agriculture (Cantab.) or D.T.A. (Trinidad) an added advantage. Experience in seed production with small scale farms in Africa and of intensive methods of production under both dryland and irrigation conditions desirable. N.D.A. applicants with suitable experience may be considered in certain circumstances.

Salary: Rands 2,172—4,800 (£ Sterling 1,267—2,800) p.a., plus an inducement allowance in the range £153—£372 p.a. Tax free gratuity 25% of salary and inducement allowance. Contract 2 years.

MALAWI

(1) Agricultural Research Officer (Rice Agronomist) *RC 213/134/016*

Duties: To draw up and execute a programme investigating all aspects of rice agronomy under rain fed and irrigated conditions.

Qualifications: Degree in Agriculture with preferably experience in field experimentation.

Salary: £1,485—£2,600 p.a.

(2) Extension Aids Officer *RC 213/134/034*

Duties: To undertake the organisation, financial control and administration of the Extension Aids Section; to plan the implementation of programmes using mass media and audio visual aids; and to evaluate and report on programmes, staff and methods.

Qualifications: Degree or Diploma in Agriculture, with experience in administration and agricultural extension work, including some aspects of audio visual media.

Salary: £2,655 p.a.

The above appointments also carry, in addition, a supplement of £100 p.a. (payable direct to the officer's bank account outside Malawi and Rhodesia). Tax free gratuities 15%–25%. Contracts 2–3 years.

If you wish to apply for any of these appointments, or you are interested generally in an appointment overseas, please write giving your full name, age and brief particulars of your professional qualifications and experience to the:

Appointments Officer
MINISTRY OF OVERSEAS DEVELOPMENT
Room 330a, Eland House, Stag Place,
London, S.W.1.

MINISTRY OF OVERSEAS DEVELOPMENT